THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVII. No. 1725.] LONDON, JUNE 2, 1896. [48TH YEAR. PRICE 6d.

JAMES OAKES & Co.,
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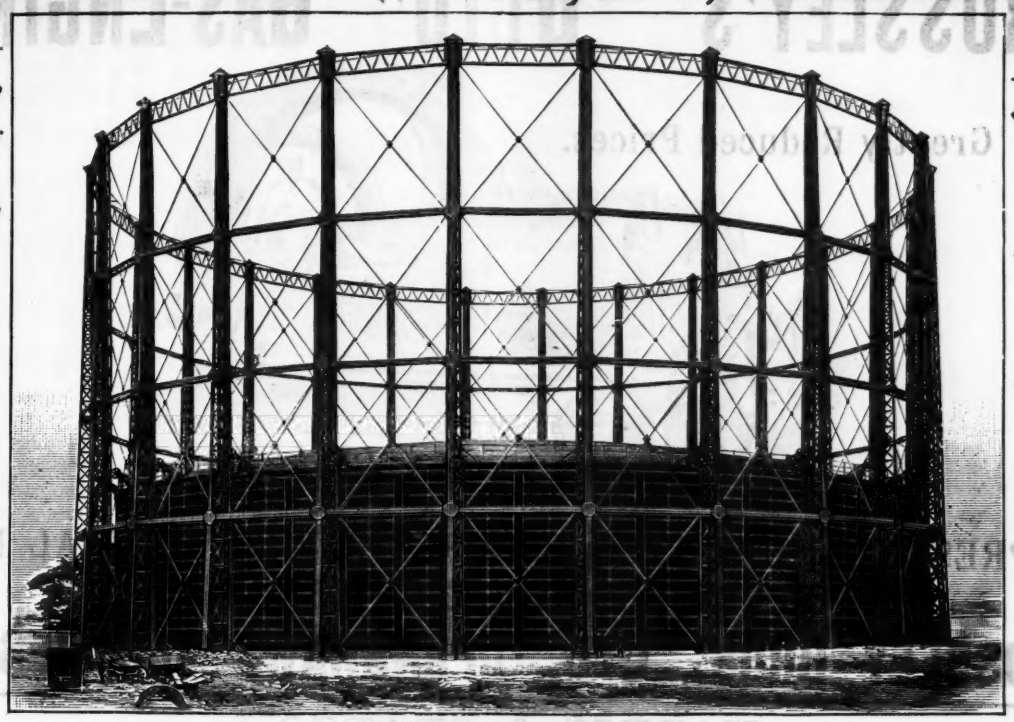

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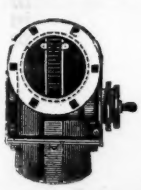

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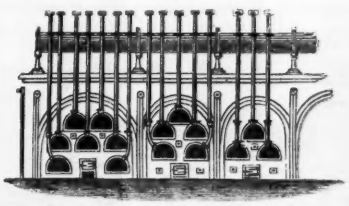

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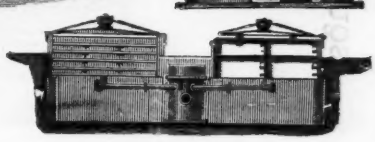

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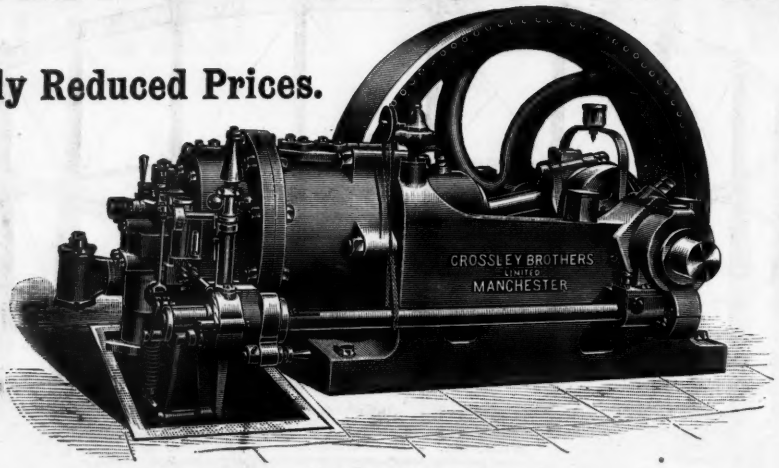

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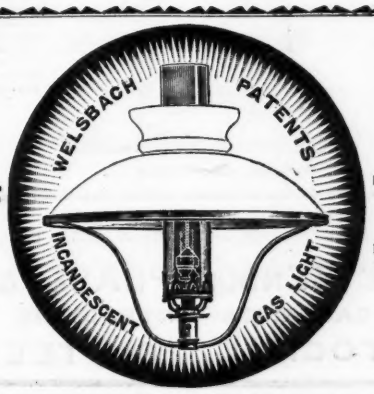

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This Pattern is particularly recommended where it is desired to effect a large saving in Gas rather than to effect a great increase in the Light.

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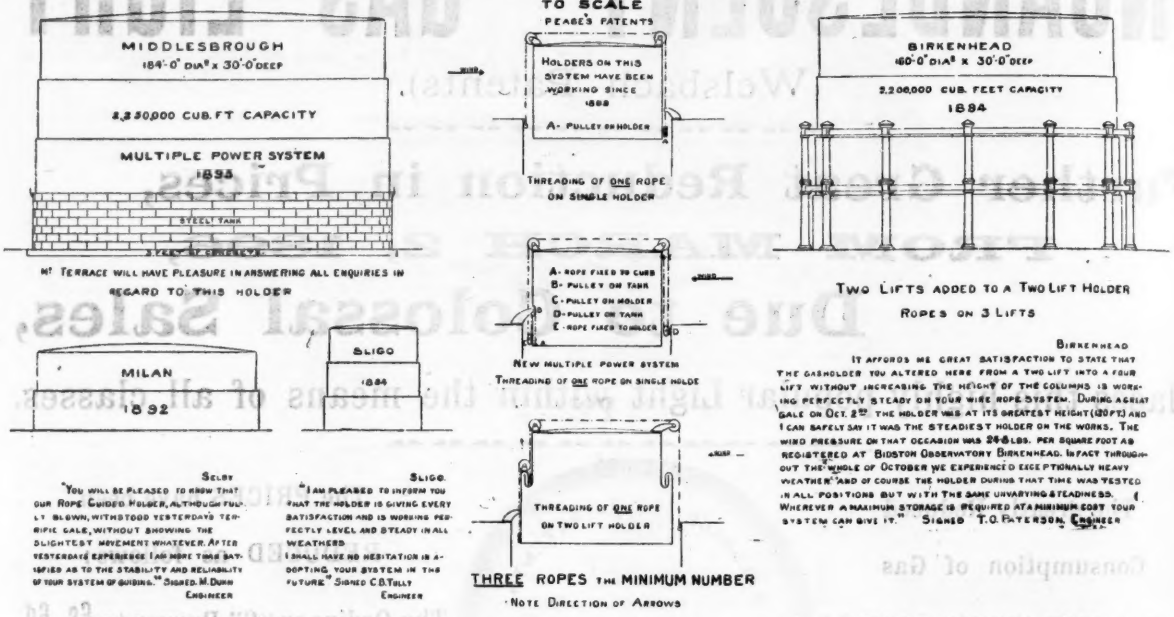
TO SCALE

PEASE'S PATENTS



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SLIGO.

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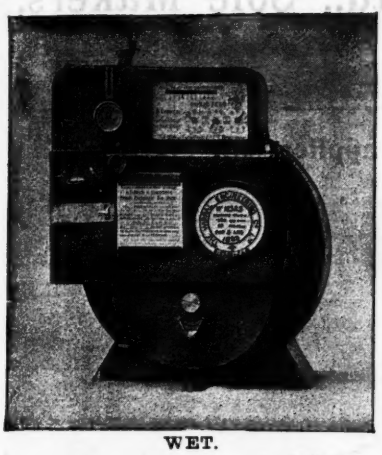
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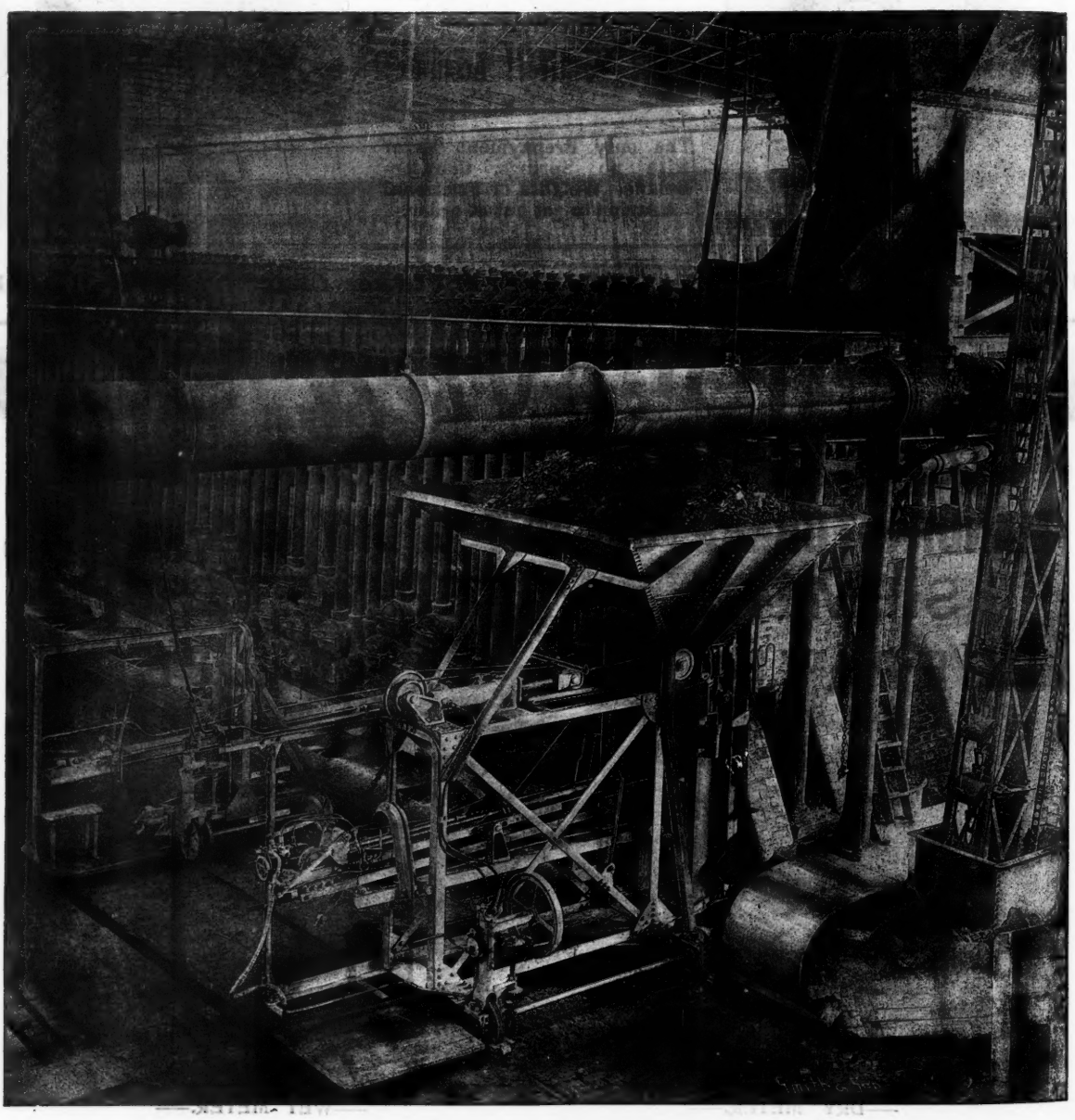
Plans and Estimates furnished on application.



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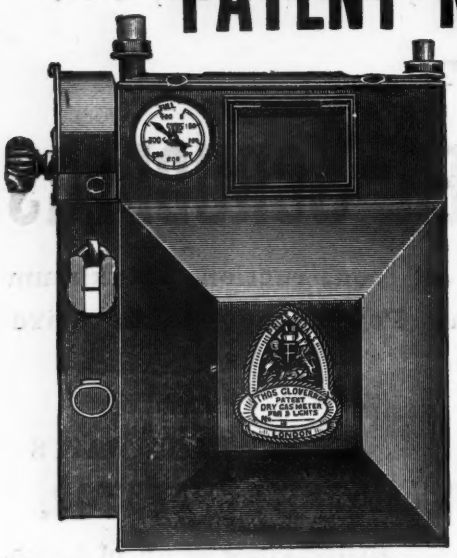

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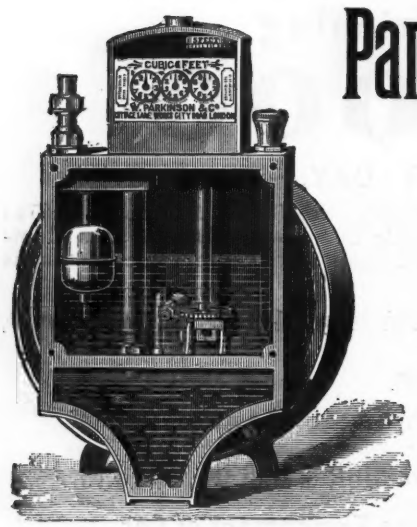

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Works with very little friction.

Will stand very high pressures.

Cannot possibly be shut off by sudden increase of pressure; the float being affected by outlet gas only.

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[See also Advt. p. 1248.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EDITORIAL NOTES.

The Gas Institute Programme.

THE programme of the thirty-third annual general meeting of the Incorporated Gas Institute, to be held in the hall of the Society of Arts on Tuesday, Wednesday, and Thursday of next week, is very full, and contains good promise of interest. Mr. W. R. Chester, the Engineer and General Manager to the Gas Department of the Nottingham Corporation, is the President; and his Inaugural Address may be expected to be replete with sound technical matter. In the list of papers and communications to be read will be found one on "New Details in Gasholder Construction," by Mr. E. Lloyd Pease, of Stockton, whose name is a sufficient guarantee of the excellence of his promised contribution to the proceedings. Mr. J. Holliday, of Scarborough, will give a paper on "Gas-Engines as Economical "Motors"—an always appropriate topic of discussion for a gas managers' meeting. Mr. F. G. Dexter, of Winchester, has a good claim to be heard when he offers to recount "A Season's Experience with Incandescent Public "Lighting." Mr. Andrew Dougall, of Tunbridge Wells, the deservedly esteemed Honorary Secretary of the Institute, will discourse acceptably upon "The Popularization of "Gas." Mr. W. Sugg and Mr. W. J. Dibdin, upon "Photometers and Standard Burners" and "Suggestions "for a Standard Photometer" respectively, should be able to command the attention of the serious-minded members of the Institute. Mr. E. Herbert Stevenson has experience in the subject of his paper on "The Principles of Transfer "of Gas Undertakings from Companies to Local "Authorities." Mr. Norton H. Humphrys, of Salisbury, has chosen an important question of administration in "Letting Gas Apparatus on Hire." In addition to the preceding, Professor Frank Clowes, of the University College, Nottingham, is to lecture on the Wednesday morning on "Explosive Mixtures of Combustible Gases "with Air, and Methods of Detecting and Measuring "Minute and Dangerous or Explosive Proportions of "such Gases"—introducing, as may be supposed, the detective appliance designed by him in co-operation with Mr. Boverton Redwood. The Friday's excursion is to be a steamboat trip down the Thames to the Nore Light, stopping at Sheerness for a view of the dockyard and the flagship.

Besides the technical business, there will be the usual formal proceedings, presentations of accounts and prizes, and so forth, on the first and last days of the gathering. The meeting of the donors and subscribers to the Benevolent Fund will be held at the termination of Tuesday's afternoon sitting, when it is hoped that contributors will endeavour to attend. The accounts of the Committee of Management of the fund show that the total income for the past year amounted to £130, of which only £59 was in the form of annual subscriptions. This is not a creditable showing for the gas industry. The expenditure amounted to £124; thus leaving a balance of £6 to be carried forward. There is every reason to believe that the fund is well and prudently administered; and it ought to be much better supported than it is, or has been for many years past. It will be noticed that the *agenda* provides for three whole-day sittings; and the only concession to social amenities is a *conversazione* fixed for the Wednesday evening at the Westminster Town Hall. It should be mentioned that the annual report of the Council is a very brief and almost colourless statement, relating mainly to the condition of the Institute as regards membership. Special reference is made to the loss sustained by the Institute in the death of Mr. Denny Lane. Regret is also expressed at the resignation of Mr. F. G. Burfield, "who so admirably carried out the duties "of Secretary for the past three years;" and the appointment to this office of Mr. Walter T. Dunn is duly mentioned. There is nothing in the Council's report this time about experimental research or the watching of parliamentary proceedings. Altogether, the Council are to be complimented on the technical and other arrangements they have been able to make for this year's meeting; and it will be the fault of the general body of members of the Institute if the attendances are not good and the discussions well sustained.

The Provisional Orders for 1896.

In another column will be found the text of the Board of Trade "Memoranda" stating the nature of the proposals contained in the Provisional Orders included in the Confirmation Bills of the present session. There is nothing very remarkable in the manner in which the Department has dealt with these mostly humble projects of legislation. The Inspectors of the Board continue to exercise a reasonable discretion in revising the Provisional Orders relating to gas supply which come before them. They appear to treat every case with strict reference to its merits; but not without some little prepossession in favour of the policy of granting the applicants a little less than they ask for in the first instance. The caution has evidently been circulated from head-quarters that a maximum price of gas is not to be fixed for any locality off-hand, or without the opportunity for revision. Consequently, in all Orders it is now provided that a maximum price is only to hold good for two or three years, at the expiration of which period the Board of Trade have power either to revise the maximum or to substitute an initial price for it, with the sliding-scale. This is practically to impose the sliding-scale upon gas undertakings, with or without the consent of the proprietors. Once more, seeing how reasonably and with what little friction the Provisional Order system works, it may be permitted to us to wonder why any gas undertaking in the country remains without this protection, which is also a certain means of putting a gas company on a right footing in its own locality.

Wreck of a St. Louis Gasholder.

It is reported that the city and district of St. Louis, U.S.A., was visited and devastated on Wednesday last by a cyclone of extraordinary violence. The newspaper statements respecting this terrible disaster have been so confused, by reason of the desperate attempts on the part of the writers to be "graphic," that it is only possible to gather from them a general notion that some hundreds of lives were lost and a vast deal of property destroyed by this storm. It is ten thousand pities that modern newspaper reporters, especially American, should have so generally lost the art of telling a plain tale, that it is with the greatest difficulty one can understand from them what has really happened when there is something worth reporting. There is no need for "piling up the agony" in such a case as the St. Louis hurricane, which seems to have been an awful illustration of the great force that wind currents can attain under favourable conditions on the wide plains of central North America. Of course, it was always so; but when the shelterless lands by the Missouri and Mississippi were only roamed over by the more or less noble savage and the very occasional white hunter, the native tornados might "tornade" at will, and nobody care or know anything about it. Now that the plains are spanned by railways, and spotted with towns duly provided with gasholders and other appliances of civilization, the irregular occurrence of the cyclone, however infrequent, has become a subject of more than local interest. We learn from a brief and unusually intelligible report, that where the latest cyclone struck St. Louis a swathe half a mile wide and four miles long was cut through the town and suburbs; leaving nothing standing within this area. Unfortunately, the gas-works, or at any rate a gasholder, happened to be in the line of the blast; and this is one report of what occurred: "When the storm was at its highest, a gasometer "collapsed, and the people were terrified by columns of "burning gas leaping high in the air. The tank was "nearly full at the time, and the force of the wind caught "it and turned it over. As the immense column [*sic*] which "supported the tank proper fell, the gas became ignited, "and burnt for a few minutes at a fearful rate." It is obvious that something serious happened to this "gaso-"meter," yet the narrative bears traces of having been so superfluously padded out by the non-technical imagination of the reporter, that it leaves a good deal too much to ours. Where is the sense of cabling, at a high cost, such utterly supererogatory statements as that "the people "were terrified by columns of burning gas leaping high "in the air"? Surely, the dullest reader might be trusted to picture for himself the effect of the ignition of the escaping contents of an overturned gasholder. But did it really and truly capsize? That is the doubt which all this "picturesque" newspaper writing leaves upon the technical mind. It seems evident that such wind pressures as that to which the stricken portion of St. Louis was exposed on this occasion cannot be fully provided against by the science of the engineering constructor. When one reads of railway goods yards full of overturned trucks and their freight, of houses with sides torn off, and streets impassable through tangled masses of what were once overhead electric wires, one can but form the impression that any gasholder exposed to such meteorological vicissitudes must have a particularly bad time of it, whether the "tank proper" is supported by an "immense column" or by other and more usual means of guidance.

The Blot upon Co-operation.

A congress of co-operators has just been held at Woolwich. It was supposed to be attended by a thousand duly accredited delegates of successful co-operative societies, mostly distributing, though a few producing organizations were represented at the meeting. An interesting address was delivered to the delegates by the Earl of Winchilsea and Nottingham, and a large number of resolutions were discussed and passed by the earnest co-operators. It was curious to see how many and persistent attempts were made by outside interests to attach the co-operators to various extraneous "causes." Thus the particular brand of Trade Unionism represented by Mr. J. "Havelock" Wilson put in a claim to be affiliated with the respectable co-operators; and several other organizations deeply committed in party politics tried to make the delegates to Woolwich as bad as themselves in this respect. Meanwhile, though the delegates stuck fairly well to their own proper business, it does not appear that their collective labours amounted to much in furtherance of the principle to which they are pledged. The subject of profit-sharing, for instance, had been remitted to a Committee for consideration and report; and the report when it came was distinctly unfavourable to the idea. Practically, the Committee found that, in the capacity for production, a profit-sharing workman was no better than any other workman; so they regarded the supposed inducement of a share of the profits as thrown away upon him. It is not for us to cavil at this finding of the Committee, which may have been justified by the evidence laid before them; but the fact of their having so uncompromisingly shut the door upon something which at least promised to lead to fuller co-operation in industry than the world has yet realized, seems to bear out the familiar reproach that co-operative societies are prone to be hard employers. As Lord Winchilsea hinted, they have a tendency to rivet round the necks of others the fetters of the same competitive system from which they are really intended to deliver their own members. This is a pity; and it is impossible to wish success unreservedly to the co-operative movement, unless it is absolved from the suspicion of "sweating" its own employees. Evidently, the day of the individual employer is not yet over, since it is he who initiates and practises all that is liberal in industrial organization.

An International Miners' Conference.

The coal miners' international conference has just been held at Aix-la-Chapelle; the principal proceedings being, as usual, the proposing and voting upon all sorts of high-sounding resolutions far removed from any prospect of practical realization. It is a curious commentary upon the flattering testimonial recently presented to the Continental, and more especially the German, workman by the deputation of the British Iron Trades' Association, that, as a rule, the German miners who attend these international conferences have been conspicuous Socialists and revolutionaries. Notwithstanding this drawback to the usefulness of these gatherings, it appears to be the impression of impartial observers that they do a certain amount of good in a way. For one thing, the conference was the means of disclosing the German miners' view of the national workmen's assurance, which is compulsory throughout Germany. As to this, it is asserted that while there is not the slightest doubt that the workmen are very much benefited by the system, it has nevertheless been a disappointment to every one concerned—to its promoters, because it has increased the number of accidents, and because the bureaucratic complications have become insurmountable; and also to the workman, because what

he receives is too much to starve upon and not enough to live upon. It is explained, however, that the law was not intended to abolish thrift and to provide a comfortable future for all. The only object was to prevent absolute pauperism. Still, the amount of real industrial advancement attributable to these congresses cannot but be infinitesimal as long as there is so little agreement among the delegates as to what should be the character of the discussions, and while the vast majority of the working miners are so misrepresented by the professional agitators who pretend to speak in their name. Notwithstanding the guarded approval expressed by those who see in these international gatherings a means of education for those who participate in them, it is quite as reasonable to entertain the suspicion that they are likely to be productive of much mischief by instilling into the Continental workmen some of the worst ideals of British Trade Unionism, while infecting the British delegates more and more with the idle dreaming propensities of German Socialists.

The Strike in the London Building Trades.

THE partial strike in the building trades of London is still dragging on to the inevitable conclusion. But meanwhile some intelligence respecting the course of the affair was given to the public last week, which deserves attention from all who are interested in watching the ways of Trade Unionism. Day by day the newspapers have published reports of large firms who were stated to have agreed to the terms demanded by the men's societies, thus enabling a considerable number of operatives of different descriptions to return to work, and rendering the eventual triumph of the Union cause more certain than ever. Sometimes, but rarely, the source of this information was disclosed, when it invariably emanated from the Union head-quarters. Those who knew something of the manners and customs of strike organizers understood how much, or rather how little, credence should be given to these reports; but the general public could scarcely fail to be misled by them. On Thursday last, however, the Central Association of Master Builders issued a statement which brushed away all these Trade Union cobwebs. The Committee of the Association denied that the employers had yielded in the manner reported, and declared that they had never been more firm in their resolve to put a stop to the real fountain of the present trouble—the intermeddling of Union officials with men in their lawful work. The masters have already agreed with the Bricklayers', Plumbers', Smiths', Carpenters', and Fitters' Societies on the terms of a settlement which will effectually protect all workmen from this interference; but the Labourers' and the Plasterers' Unions are still recalcitrant. The London County Council, it should be noted, are acting in complete accord with the other employers in this regard, and have adopted a strongly-worded resolution to the effect that no workman is to be prejudiced in his employment by the fact of his belonging to a Trade Union or not. The present trouble has been created, so say the employers, by the London Workmen's Trades Federation, which has introduced what is called the "ticket system." The members of all Unions affiliated with the Federation are supplied with tickets which must be shown to the officials of this organization at certain dates. Any workman without a ticket is required at once to comply with the regulation. If he refuses, either he has to quit his job, or the Federation men working with him threaten to strike. It is against this monstrous tyranny, the creation of a body which largely consists of, and is wholly dominated by, the professional agitator element, that the master builders of London are now fighting. The London County Council have dealt with it by their resolution already mentioned; but if all the other London employers were to be beaten upon the point, it is certain that this resolution would have to be rescinded. The employers will and must win in the end, however long this may be deferred, because they have already agreed upon the point with the most influential orders of workmen in the building trade, to say nothing of the essential reasonableness of their position, which in itself should ensure victory. All the same, the action of the rebellious Trade Unions is an invaluable object-lesson for those well-meaning philanthropists who would fain think that these societies are always to be unhesitatingly trusted to follow no counsels whatsoever save such as are righteous and just as between man and man.

WATER AND SANITARY AFFAIRS.

A LETTER of considerable length has been addressed to the Earl of Onslow by Mr. A. H. Smee, a member of the Surrey County Council, raising the question whether the clauses in the Metropolitan Counties Water Board Bill are sufficiently favourable to the water supply of Surrey, or whether they do not "sacrifice the rural districts for "the benefit of what may be considered the Metropolitan "area." Though the letter is a little faulty in its grammar in one or two places, it contains a considerable amount of information; and while we may dissent from a portion of the views entertained by the writer, we meet with some suggestive remarks deserving of notice. A doubt is expressed whether a member of the Water Board, elected as proposed by the Government Bill, will have the requisite training by which to deal with the complex problems involved in the management of the undertakings now possessed by the Metropolitan Water Companies. If this qualification is wanting, as Mr. Smee thinks it very likely will be, there is the prospect that the real control of the supply will fall into the hands of the permanent officials. Another contingency which Mr. Smee contemplates is that the members of the Water Board will have to be paid a large salary. This is a point on which little, if anything, has yet been said. But it is a very fair question to be raised. If the present management of the water supply demands the attention of eight Boards of Directors, receiving in the aggregate over £27,000 per annum, is it likely that the same amount of service will be obtained for nothing? Of course, there is a certain way of doing things which may pass muster for actual control. But real work has to be paid for; and on this principle the County Council formerly paid a large salary to their Deputy-Chairman. The duties attached to that post have lately been transferred to the Clerk of the Council, and the salary of the Deputy-Chairman has ceased. But if £1500 per annum was not too great a remuneration for the services thus rendered in the past, what would be the proper pay of the Chairman of the Metropolitan Water Board? Could even the ordinary members of the Board be expected to fulfil their duties without salary? If the work is not paid for, it will assuredly not be done as it otherwise would be. What happens in such circumstances is well illustrated by a case which has come under the notice of Mr. Smee in the South of England, where one part of a town is supplied with water by the Local Authority, and the other part by a Company. In the last-named case, the daily consumption is something like 15 gallons per head, while in the part where the supply is managed by the Local Authority the consumption has been as high as 50 gallons per head. The larger figure is due to waste on a considerable scale, involving unnecessary expense; and this is only to be prevented by close supervision, such as a Board of Directors will exercise for the sake of their shareholders. Whether a Water Board will do as much for the public is questionable; and it may also be doubted whether the Board will "know how."

The remarkable scheme intended to secure "Welsh "water for Wales," of which an account appeared in our columns last week, was the subject of an important resolution passed by the Water Committee of the Glamorgan County Council last Thursday. The Committee recommend the Council to draft a Bill combining the counties of Glamorgan, Monmouth, Brecon, and Carmarthen in one huge Water Trust, in order to preserve the water supplies of the eastern portion of South Wales, otherwise in danger owing to the designs of the London County Council. The Trust is to be framed after the manner of the Metropolitan Counties Water Board; and the Committee propose that the Local Government Board shall be asked to assist in introducing the Bill into Parliament. To apply to the Government to assist in upsetting the Welsh water scheme of the London County Council is certainly a bold idea; and such a proposal cannot be supposed likely to receive a very cordial reception from Mr. Chaplin, who would very clearly perceive the kind of hornets' nest into which he was invited to plunge. That four or five Welsh counties taken together should contemplate an aggregate expenditure of ten millions in order to make sure of a local water supply, is itself a surprising circumstance; and it would further be interesting to witness a parliamentary contest between the London County Council and the Welsh authorities for the possession of

the head waters of the Usk, comprehended in the first part of the scheme. But London can very well afford to let Wales enjoy her own devices; Glamorgan and her allies having liberty to spend their millions as they please, while the Metropolis remains content with resources nearer home, though as a fact the head waters of the Thames are sufficiently far away towards Wales, only Nature gives an aqueduct to London without charge.

The great deficiency in the rainfall during the course of this year, excites a very reasonable apprehension as to the water supply of a considerable part of England in the coming summer and autumn. Mr. Crookes and Professor Dewar have mentioned that during the first four months of the year at Oxford the rainfall was deficient to the extent of rather more than 3 inches. The weather report in "The Times" shows that the driest period of all extended from April 17 to May 20 over England. At Oxford there was no rain for 31 consecutive days, and in London for 21 such days. London has no fear of drought; but the same sense of security does not apply to all our large towns. Should the ensuing summer prove hot as well as dry, there will be an enlarged consumption of water; but the London Companies will be found equal to the occasion, though this has only been accomplished by a judicious extension of works. If Parliament will give the Companies the requisite powers, there will be no failure in the supply of water to the Metropolis and over the entire area for which the Companies are responsible.

PERSONAL.

Mr. T. G. WILCOCK has been appointed Secretary and Manager of the Shipley Gas Company, in place of his brother, whose assistant he was for some years.

Mr. J. M'CUBBIN, Assistant-Manager at the Greenock Gas-Works, and a son of Mr. J. M'Cubbin, of Port Glasgow, has been appointed, out of 77 applicants, Manager of the Chorley Gas-Works, in succession to Mr. R. Fearnley, resigned.

Among the recent transfers by the Council of the Institution of Civil Engineers of associates to the class of members were Mr. C. C. CARPENTER, of Vauxhall, and Mr. W. B. WHITAKER, Engineer of the Compania Gas Argentino, Buenos Ayres.

Mr. W. T. BARK has been selected, out of upwards of 60 applicants, for the position of Manager of the Tenterden Gas-Works, in place of Mr. S. E. Bark, who, as already mentioned in the "JOURNAL," has secured the appointment of Manager of the Sunbury-on-Thames Gas-Works.

Mr. A. C. YOUNG, late Manager of the Auchterarder Gas-Works, and now Manager to the Maybole Gas Company, was presented last Wednesday, before leaving Auchterarder, with a marble timepiece and a case of instruments, which had been subscribed for by the townspeople. Mr. Young has been Manager at Auchterarder since 1888; and during that time he has effected many improvements on the works, including the introduction of regenerative firing and the Peebles oil-gas process.

Mr. J. C. MORTIMER, late collector for the Blackfriars district of The Gaslight and Coke Company, was last Thursday entertained by his colleagues at dinner at Anderton's Hotel, Fleet Street. During the evening, Mr. John Fowler, on behalf of the subscribers, presented Mr. Mortimer with a testimonial, in the form of a clock and an illuminated address, as a mark of their esteem and appreciation of his genial disposition and good fellowship, upon his retirement after 38 years' service. Mr. Mortimer acknowledged the gift in a few well-chosen sentences.

Gas Engineering Society.—The next meeting of this Society will be held in the Engineering Lecture Theatre at the Goldsmiths' Institute, New Cross, S.E. (by permission of the Governors), on Wednesday, June 10. The subject will be "Gas-Engines;" and the lecturer, Mr. J. Lineham, M.Inst.M.E. The Secretary, Mr. E. D. Weippert, 6, Weigall Road, Lee, S.E., will be pleased to supply tickets of admission. The Society's year is just commencing; and gentlemen wishing to join can obtain full particulars from the Secretary.

The Price of Gas in Birmingham.—In Alderman Pollack's remarks in reply to the discussion on the presentation of the report of the Birmingham Gas Committee, as given last week (p. 1177), the words "per annum" were accidentally omitted after the figures "£190,893" at the end of the paragraph; and the quotation in the editorial columns followed the report. What Alderman Pollack said was that "the Committee had reduced the price of gas from the time of the transfer by £190,893 *per annum*." The average price of gas in 1875, before the transfer, was 3s. 1¼d. per 1000 cubic feet; whereas now it is 2s. 2·40d.—a difference of nearly 11d. This difference is not one of recent years; but it fairly represents the average reduction in price since the transfer.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1234.)

BUSINESS on the Stock Exchange last week was, in the aggregate below the average, as the markets took some little time to get into swing on re-opening after Whitsuntide; and, indeed, they never quite attained full speed. But though transactions were thus limited in a degree, the general tendency was favourable; and they left off well. Prices are, for the most part, higher. Consols were strong—marking 113⅛ on Saturday. But the most conspicuous market was that for home railways, which was very buoyant; and a noteworthy feature was the attainment of a cent. per cent. premium by North-Western ordinary on Wednesday. This is one more result of the enormous accumulation of money nowadays, which is irresistibly forcing up the price of every sound investment. The Money Market presents no new feature; but it had the advantage of the Stock Exchange settlement last week. There was a fair amount of business on the whole done in the Gas Market, though operations were largely confined to the two heavy issues. With a few exceptions, the general tendency was favourable; and several moderate advances in quotation were scored. In Gaslights, there was a good average number of transactions done in the "A" stock, which was marked steadily at 312 until Friday; when it touched 309; and the quotation was put down a point. The next day, however, 312 was again the mark; and the old quotation was reinstated. Very little was done in the secured issues; but good figures were realized by what changed hands. Moderate business only was transacted in South Metropolitans. But excellent prices prevailed; and the "A" was marked at 412, with a rise of five points in the quotation. Commercials did not make any show. The Suburban and Provincial division were very quiet indeed; and no variation took place. Among the Continentals, the greatest falling off took place; Imperial being weak, with a relapse of five points. The rest were very quiet and unchanged. Several of the remoter undertakings advanced. Belgrano rose at the prospect of a higher dividend; Bombay, Oriental, and Cape Town improved *ex div.*; but San Paulo receded. Business in the Water Companies was, with a few exceptions, very restricted; but the general tendency was very favourable, while some of the Companies made considerable advances. Among these, Chelsea, Kent, and Grand Junction had a 7 per cent. rise; the latter improving in view of the next dividend being at the rate of 7½ per cent., as against 6½ per cent. for the previous half year.

The daily operations were: Business was rather limited on the re-opening on Tuesday; but prices were pretty good. Belgrano rose ½, and ditto debenture 3; but Imperial Continental fell 1; and San Paulo, ½. In Water, Grand Junction gained 1½. Transactions remained just as restricted on Wednesday; and the only change was a rise of 5 in South Metropolitan "A." In Water, Kent advanced 5; and Chelsea, 4. Thursday brought no increase of activity in Gas. Imperial Continental receded 1. In Water, Chelsea preference rose 2; and ditto debenture, 1. Friday was the most active day of the week; but prices were flat. Gaslight "A" fell 1; and Imperial Continental, 2. Things revived on Saturday, and closed better. Further advances were made in Water. Chelsea moved up 2; and Grand Junction, 2.

ELECTRIC LIGHTING MEMORANDA.

A Wonderful Report—A Commentary on the Report—Edison and Interviewers—Protesting Overmuch—A Plethora of Wonders.

ACCORDING to a report telegraphed from New York last week, the great Edison has discovered a method of converting the Röntgen rays into brilliant light. By coating a Crookes tube on the inside with fluorescent crystals, a pure white glow resembling sunlight is stated to be produced. A mysterious statement follows that "no moonlike effect can be arranged in the multiple arcs system." We cannot surmise what is meant by this; but it is probably as reliable, whatever it is, as the substance of the previous statement. The communication goes on to say that two other scarcely less wonderful discoveries promise a revolution in electric lighting. For several weeks Mr. Moore has publicly exhibited a mysterious but somewhat faint bluish glow in a vacuum tube without arcs or filaments. Mr. Tesla also a few days ago announced the discovery of a method of inducing millions of etheric vibrations per second within a vacuum tube without using any direct electrical connection. An ordinary 16-candle bulb gives by this method a light equal to 250 candles, "which is sufficient to light very pleasantly a large room." This wonderful lamp "enables rapid and perfect photographs to be taken. Its commercial efficiency is three times as great as that of the prevailing system; and it provides an ample margin for further improvement."

This is all very fearful and wonderful. The only technical journal which has as yet had the opportunity of repeating this intelligence, with a commentary, is the "Engineer," which unkindly observes that it is "too much accustomed to vague

comments of this kind concerning Edison's work to attach much importance to this." Our contemporary, however, regards the statement that Tesla has "at last discovered that of which he has so long been in search," as more interesting. It is at any rate regarded as a sufficient peg on which to hang a reflection that "it is rapidly becoming obvious that the received theories of light are quite inadequate to explain new discoveries. It may yet be found that there exist means of transmission of energy of which we have no mechanical analogue—no mechanism, in fact, which is understood. Dr. Lodge hinted at this years ago when he said, after dealing with certain aspects of the vibratory theory, 'perhaps, after all, there is no motion.'"

It is difficult to decide whether the report from America is more excellent in glory than the English commentary upon it, or the reverse. So far as the statement about Edison's work is concerned, our contemporary is justified in regarding it lightly —if the term is permissible in this connection, no pun being designed. Edison is a remarkable person, and his enterprising journalistic fellow-countrymen have long discovered that there is little satisfaction, from their own professional point of view, to be derived from the process of "interviewing" him. He will see anybody, if he has the time, and let his interviewers put into his mouth whatever statements they choose to ascribe to him. He never contradicts his reporters; and this characteristic of the man is so generally known that now nobody is taken in by the outrageous assertions published in American newspapers professedly upon his authority. Consequently, the great national wizard is not regarded as a wholly satisfactory subject for a sensational press interview, which requires at least a presumption of verisimilitude to send it "the round of the papers." Matters in the electrical world must have been considered dull indeed before the despairing reporterprepared to fall back upon the stale expedient of telling something fresh about Edison's doings.

With regard to Tesla's work, our contemporary is likewise right, on general grounds, in holding statements respecting it as more interesting than yarns about what Edison has done or is on the point of doing. All the same, there is that about the report in question which arouses suspicion of its genuineness. It is well known that Tesla has been trying for years to stir up the ether to do something for itself, without needing the roundabout excitement of boilers, engines, and other heavy paraphernalia which are just as appropriate to stone breaking. But why take the trouble to inform the expectant world that when a 16-candle incandescent lamp is speeded up to 250-candle power, it is thereby rendered "sufficient to light very pleasantly a large room"? To make matters worse, we are also told that this same lamp "enables rapid and perfect photographs to be taken." Of course it should do all this, and more; but to mention the circumstance is a blunder which belongs to the category of proofs that go too far beyond the necessities of the case. A very small acquaintance with the practice of Law Courts instructs one to entertain the deepest suspicion of the most confident witness who is not content with telling his story, but must needs corroborate his plain asseverations by elaborate circumstantial details. In this instance, we could believe in Mr. Tesla's way of converting 16 into 250 candles much more easily if we had not been assured in the same breath that the result has such very ordinary effects.

As for Mr. Moore's success, such as it is, this appears to be the same thing that was reported of his experimental working many months ago. Here, again, the New York electrical reporter has overshot the mark in his zeal to make out that electric lighting has accomplished an enormous advance. He should not have worked so many authorities into one paragraph. One could have swallowed Edison, properly salted; and one other might have gone down with him. But the gorge rises against the combination Edison, Moore, and Tesla. The thing is altogether too rich to be digestible. What, however, is to be said of the "Engineer's" lucubration? This gravely informs the world that the inadequacy of the received theories of light—the number is not given—is "rapidly becoming obvious." Now, most people who possess a competent acquaintance with the English language would wonder how the quality of obviousness can be intelligibly conceived of as a "becoming" one, whether rapidly or otherwise. Either a thing is obvious or it is not. With regard to the adequacy of the theory of light, which again is usually spoken of in the singular, we, with many other observers of the progress of science, are in the habit of regarding it as founded on a working hypothesis which may or may not be overthrown at some future period. But, after all, the theory or theories of light have nothing whatever to do with the practical question of whether a 16-candle incandescent electric lamp has been induced to yield the light of 250 candles. Until this accomplishment has been placed beyond the reach of doubt, it is a little premature to call in question the sufficiency of the undulating theory of light.

The Coal-Fields of Labuan.—In the "Indian Engineer" some interesting statistics are given relating to the development of the coal-fields in Labuan. The island contains four seams of coal varying in thickness from 1½ to 10 feet, and running from north-east to south-west. The coal is good steam coal containing an abundance of resin.

SOME PRESIDENTIAL ADDRESSES.

At the recent meeting of the Institution of Mechanical Engineers, the President, Mr. E. Windsor Richards, delivered an Inaugural Address which, besides being well filled with technical matter of much value to the members of the Institution, contained some observations of considerable interest to a wider circle. If it is no easy task for gentlemen called to the office of President of one of our numerous scientific and technical Institutions to find fresh subjects for their addresses, it is equally difficult for even the limited section of the public to which both Presidents and audiences belong to keep in touch with these *ex officio* mentors, so as to benefit by the outpourings of wisdom to which they so magnanimously treat the busy world around them. There is such a flood of similar discourse in all the scientific and technical journals, and it is such painful work to fish in it for the small fry of nutrition which ordinary minds can alone assimilate! Mr. Richards, however, belongs to the modern order of Presidents, who are nothing if not severely practical. He found himself confronted, as the spokesman of British Mechanical Engineers, with a state of things calculated to put upon his mettle anybody occupying such a position. Much has been said and written for some time past about the decadence of the national metallurgical and engineering industries. "It has been alleged," he declared, "that the machinery we employ is neither so economical nor so efficient as that of late years adopted in competing countries; that our commerce has declined for want of energy and enterprise on our part; and that we are being rapidly outstripped in the race for the supremacy which we have so long enjoyed." He accordingly set himself to improve the occasion offered by his having to address the Institution of Mechanical Engineers by trying to clear up the facts upon which the allegation rests. It was a large subject, and was worthily dealt with.

Mr. Richards found the way of criticism opened for him by the remarkable report of the delegation sent last year by the British Iron Trade Association to Belgium and Germany, already discussed in these columns; and he was able to supplement the information obtained by this deputation with data collected and digested by himself. This matter constituted the bulk of his address; and, from its nature, it is matter in much of which we are here only indirectly interested. Gas engineers are employers of mechanical engineers, rather than members of the order in their professional capacity. It is their part to decide what mechanical appliances they require for their own purposes; and they look to the mechanical engineers to supply their needs in this respect, according to the best prevailing practice. Consequently, the condition of British mechanical engineering is a matter of great interest for gas engineers, who wish to be assured that they can get what mechanical aid they may need from their own neighbours without having to go abroad for it. Like all other home consumers of metals and purchasers of machinery, British gas engineers have of late years had only too much reason to entertain the uncomfortable suspicion that they could suit themselves better in some respects from foreign sources than by confining their patronage to native firms. One has heard far too much talk of Belgian and German iron and steel, American boilers and blowers, German pumps, and other materials and fittings of foreign origin, as being preferred for various reasons to the home-made article; and even of coke-ovens called by strange names that threaten the gas maker's market for some of his most reliable residuals.

Mr. Richards's address may be referred to for evidence showing how strenuously the foreigner is striving to improve the footing he has already gained in the field of iron manufacture and mechanical engineering. Take the example of certain blast-furnaces now being built at Dortmund. Here "the coal for coke making is washed and crushed, and stocked in capacious bunkers, placed sufficiently high for it to flow into small waggons with bottom doors for charging through apertures in the tops of the ovens. The Coppée coke-ovens, with some improvements by Dr. Otto, are arranged at one end of the works in two groups of fifty each. The bye-products, consisting of sulphate of ammonia, oils, and pitch, are obtained; and the cleaned gases are utilized for heating the walls of the ovens and raising steam. Each oven produces 4 tons of dense coke per 24 hours, at a cost of about 10s. per ton. . . . The 100 coke-ovens with bye-product plant are estimated to cost £75,000." Again, in France and in Belgium, every effort is being made to save money by treating blast-furnace and coke-oven gases for the recovery of residuals, and also by utilizing the sensible heat for steam raising and other purposes.

Lastly, having discussed railway rates, Mr. Richards had a few pregnant words to say upon the subject of labour costs. He is not afraid of high wages in themselves, but is of opinion that "our labour has become far more difficult to manage, is much more ready to stop work in order to obtain an increase of wages, and is constantly agitating for fewer hours of work. Every concession made renders it more and more difficult to compete with the Continent in the markets of the world. But our workmen cannot yet be brought to see this; neither can they be persuaded to cease opposition to mechanical devices for saving labour and reducing costs. Indeed, all

such appliances are jealously watched; and, if possible, their success is prevented. Yet the favourite remedy for this state of things in many minds is to spread technical education all over the country; whereas, if the result they desire could unhappily be attained, the last state of the trade would be worse than the first, for we should have no hewers of coal nor makers of steel. The truth is, there is no lack of technical ability in this country; quite the contrary." Continental competitors with British manufacturers do not claim any superiority in this respect; and, moreover, what they know we can easily learn and adopt. "But they can and do claim that they have trained skilful, careful, and obedient workmen," which Mr. Richards ascribes largely to the compulsory military training undergone by the men. It is a significant indication of the change that has come over British industrial sentiment since the era when the so-called "Manchester School" of economists regarded militarism as the accursed thing, that the President of the Institution of Mechanical Engineers should to-day declare it to be his deliberate judgment that "a compulsory strict military training, to follow the sound and excellent education now given to every one, would contribute greatly to the general good of our country."

Mr. Richards's address was utilized as a peg on which the "Engineer" hung an article really dealing with something not even mentioned in it. But this afforded our contemporary the opportunity for remarking in its accustomed vein that "those who see in education a panacea for all commercial ills, never stop to ask themselves whether there is any other side to the glowing picture they delight in drawing." The truth of the matter is, of course, that those who talk most about education rarely pause to distinguish between the training that is necessary for the child, and that which befits the adult, or even the adolescent man. There is much more agreement as to the former; yet of the two the latter is of the greater importance to the individual and the nation.

The greatest of all points in regard to education, however, is that the process should be understood to be continuous, so that for no man, or industry, or nation should it be other than an enormous error to treat the period for receiving instruction as terminated while life remains. We shall not be accused of undue partizanship for the British workman (new style) if we express a doubt whether the best military training alone, as desired for his class by Mr. Richards, would be justified in the long run if it merely had the effect of making him a more docile worker for wages. Discipline is a fine thing, both for those who command and those who obey. But there is something to be said on the other hand for that quality of initiative which the British workman at his best has always possessed in a higher degree, and exercised to more fruitful effect than his compeer of any other nationality. The native-born American, of course, must be ranked with him with reference to the possession of this gift, which can neither be conferred by education nor encouraged by habits of implicit obedience. The British workman, like his employer, is notwithstanding slow to learn many things. If the former is loth to make way for the labour-saving machinery which appears to him to threaten his means of earning a livelihood, the latter is just as much averse to changing his methods to suit an altered standard of trade. Most difficult of all for both workmen and their employers is it to learn why they should work together in unity of spirit, and how to give mutually satisfactory expression to the essential union of their respective interests.

A potent agency for the education of the adult workman might have been supplied in the Trade Union movement; but since this has gone so hopelessly astray in the "No Thoroughfare" of Socialism, its chance of utility in this respect must be regarded as lost, or at least in abeyance. It is worse than useless to give education to slaves. There remains the co-operative movement, however; and here the workman who desires to learn something of the truth about trading and industrial conditions may gather some information which he would hardly accept even if he could get it from any other source. Last week the annual congress of the Co-operative Union was held at Woolwich; and the proceedings included the delivery of an Inaugural Address by the Earl of Winchilsea and Nottingham. This was another of those excellent orations which, unfortunately, can only be skimmed by the ordinary newspaper reader. It must suffice here to state that the educational value of the co-operative movement was duly accentuated by the speaker. There is much to be done in this way, even within the ranks of co-operators, who are not all above the suspicion of trying to continue, for their own benefit, the worst of the industrial conditions from which they have emancipated themselves.

The last Inaugural Address which we can notice at present is that of Sir Alfred Hickman, M.P., to the members of the British Iron Trade Association, who recently met in London. This address was of a somewhat statistical cast, and dealt with the engrossing topic of foreign competition in a manner calculated to please the audience, inasmuch as it laid the blame for the troubles of the British iron trade chiefly on the railway companies. It does not appear that Sir A. Hickman had much comfort to give his auditory after all; for though he could arraign the railway companies for not carrying mineral and hardware traffic at cheaper rates, he could not hold out any hope that the railway managers would speedily be brought to see the position in the same light.

NOTES.

The Wegener System of Boiler Firing.

Mention was made at the recent meeting of the Institution of Gas Engineers of the system of boiler firing by powdered fuel adopted by Messrs. Bryan Donkin and Co., as furnishing an illustration of the possibility of instantaneously carbonizing coal under suitable conditions. It may therefore be of interest, as bearing upon this point, to state that the system of stoking in question is that devised by, and known under the name of, Herr Wegener. It is intended not only to completely burn powdered coal, but also to burn it in such a way that the quantity of fuel admitted to the furnace is varied automatically with the quantity of air supplied to support combustion. An essential feature of the arrangement is the device employed to secure the continual passage of the powdered fuel with the inflowing air; and this is effected by causing the fuel to drop through a sieve, which is incessantly being tapped by a little knocker driven by a sort of smoke-jack attachment actuated by the current of air. In this way it is claimed that the coal and the air necessary for its proper combustion are thoroughly mixed together; every particle of fuel being surrounded by air. There is neither grate nor fire-door in the furnace; the stoking consisting simply in supplying the powdered coal from time to time to the hopper, and seeing that a proper balance is preserved between the air and the coal supply. This balance is attested by absence of smoke, and a high proportion of carbonic acid in the waste gases. It is for gas engineers to determine whether anything like the same dispositions could be economically adapted to the carbonization instead of the combustion of coal.

The Benefit of Thorough Commixture.

Experimental results are accumulating to show the gain of thoroughly mixing ingredients intended to be used in combination, as the gas and the air in an atmospheric gas-burner, the coal and air in a steam-boiler, and so forth. The latest example of improved effects obtained in this way is that of portland cement and dry sand intended for making mortar. It is reported that in certain foundation work recently carried out successfully in New York, all the portland cement used, amounting to nearly 10,000 barrels, was mixed in a ball-mill with an equal quantity of sand before being made up into concrete and mortar. For the mortar, 2 parts of sand were mixed with 1 part of the ground mixture; so that the mortar really consisted of 1 part of cement to 5 parts of sand. By testing, it was found that this mortar was slightly stronger, both in tension and compression, than one mixed in the ordinary way and gauged 1 part of cement to 2 parts of sand. Again, on grinding one-fourth part of cement with three-fourths of a unit of sand, and then mixing the result with another 3 parts of sand, a mortar was made consisting only of 1 of cement to 12 of sand. This proved stronger than ordinary mortar gauged 1 of cement to 1 of sand. In fact, by proceeding tentatively on this line of experiment, it was found possible to make a very fair mortar containing only 1-20th part of cement. Moreover, the method of mixing in question is stated to yield a highly compact and impervious mortar, well suited for situations where tightness to water is required, or in work much exposed to frost. The process is due to F. L. Smidth, of Copenhagen, where it is stated to be largely used with satisfactory results. If this is true, it is only another argument in favour of making sure that mixtures are really what the name signifies, and not more or less faulty approximations to this condition.

The Power of French Lighthouses.

In an article describing the French lighthouse service, published in "Engineering," Dr. C. S. Du Riche Preller states that the French authorities, when determining the actual illuminating power of their coast lights, do not reply upon any optical formulæ, but make the most accurate and exhaustive photometric tests of every appliance and method of lighting. These tests are carried out at the Central Dépôt des Phares, in Paris; the practice being similar to that followed in the South Foreland experiments of 1885. The former practice of simply calculating the luminous power, from M. Allard's or some other formulæ, was abandoned when it was found that the first electric coast lights installed in France, according to M. Allard's programme of 1882, gave by measurement only from 60 to 70 per cent. of the computed luminous efficiency. The difference was discovered to lie in the inevitable imperfections of the optical apparatus, and to the more or less opaque atmosphere. A certain, though small, loss of light is also due to obstruction or absorption of the outer lantern, and further loss may ensue if all the optical apparatus and the lantern are not kept scrupulously clean. The photometrical test is applied in France not only to all lenticular apparatus, but also to catoptric, or reflecting, apparatus. As is known, the luminous effect of all lenticular lighthouse appliances is, as a rule, constant; while in reflecting apparatus the luminous power diminishes as the observer moves away from the axis of the light beam. The French Lighthouse Department has no high-power gas lighthouses, and few high-power mineral oil lights; having refrained from adopting the biform, triform, and quadriform systems of superposed lanterns with 10-wick burners introduced by the Trinity House and the Irish Lighthouse Board.

The New Serpollet Automotors.

In connection with the present revival of interest in mechanical traction for vehicles on common roads, it is argued by "Engineering" that the question of a safe motor is of paramount importance. For this reason, it deprecates all proposed road motors which depend for their source of power upon explosive petroleum spirit; and it warns highway authorities that when the existing restrictions upon carriages of this kind are taken off, at least as much caution should be exercised with regard to the motive power they carry as is shown in regard to storing and transporting compressed gases. Our contemporary believes that no permanent service in this connection can be rendered either by explosive vapours or electrical storage batteries; and further that the only thoroughly practical and the safest plan that has yet been devised to this end is the steam system of Serpollet. In this system, the special feature is that small quantities of water are instantaneously flashed into steam in generators which have the form of a flattened tube with thick sides. In the earlier form of Serpollet generator, the tube thus flattened was coiled into a spiral, and placed within a fire-box; but now a number of these tubes, not coiled, are assembled over a fire preferably stoked with coke. They are safe at a working pressure of 94 atmospheres, and claimed to be more economical than any other form of automotor. Up to the present, the Serpollet motors have been chiefly used on French tramways, where the system has given satisfaction and is coming into increasing use.

Gas-Fittings for Theatre Stages.

In the course of a series of articles descriptive of modern theatre stages, published in "Engineering," Mr. E. O. Sachs, an architect, mentions the arrangement of the gas-fittings for the English wooden stage. He observes that gas must be considered the illuminant commonly employed on the more primitive stages. The gas arrangements on the English wooden stage, in the first place, consist of the so-called "gas-battens," which are suspended from the "gridiron," and worked similarly to the "cloths" from the "flies." A "gas-batten" consists of a row of flat-flame gas-burners mounted on a strong length of iron gas-barrel attached to a curved sheet-iron back, which serves as a reflector, and is enclosed in front by wire netting. The length of a batten is generally the same as that of the cloths, and there is generally one batten to every set of sliders and bridges on the stage-floor. In most theatres, the battens are now arranged to be lit by flash-burners or pilots. Side and "proscenium" lights are rows of upright pipes with vertical lines of flat-flame burners projecting from them, and metal reflectors at the back. As the gas connection with these has to be frequently and quickly made and broken, the joint is a "water-joint" in the stage-floor, similar to the water-seal of a sliding pendant. "Ground rows" are lengths of similar fittings placed upon the stage-floor to illuminate the bottom of the scenery; and "gas lengths" are often hung at the back of a scene to illuminate another part of the stage. The foot-lights are placed in a recess or "sink" in front of the stage. It is usually lined with iron, and has a floor of white tiles. The whole of the gas system of the typical wooden stage is generally under the control of one man, stationed at the "gas-plate" on the "prompt" side of the stage, upon which every tap is numbered and named from the piece of lighting it controls—the numbers commencing from the proscenium "up" the stage.

The Trial of Acetylene for Tramcar Lighting in Paris.—Reference has already been made to the trial of acetylene as an illuminant on one of the tramway lines of Paris. Each car was furnished with a receptacle in which acetylene gas was produced as required on the journey, at a pressure which never exceeded 5 or 5½ inches. The question between this system and electric lighting was one of price, general convenience, and dead weight to be carried; and the advantages seemed to be all in favour of acetylene. It appears, however, that the results of the trials, which have been going on since the end of February, have not justified the Directors of the Tramway Company in extending the system, inasmuch as they have given orders for electric lighting appliances for fifteen cars.

The Action of Refuse on Water-Pipes.—The Cardiff Corporation Water Engineer (Mr. C. H. Priestley) has made a report to his Committee upon the action of scavenging refuse, with which certain streets are formed, on the water service-pipes. On the 7th ult., the water-mains and service-pipes in Court Road and Cornwall Street were opened at seven different points. In one or two places, the pipes were found to be buried in a clay ground; and in these spots they were not affected—being apparently as sound as when laid. In other places, where they were exposed to the action of chemicals in the scavenging refuse used in making up the road, the metal was affected both in the iron and lead pipes similarly to samples taken from another street, but not to the same extent—the corrosion having only just commenced. The pipes appear to have been affected more where they are laying in the wet refuse than where it is dry. The Committee have requested Mr. Priestley to see if any other towns have met with similar difficulties, and to consult the Borough Analyst on the matter. In the meantime, they have passed a resolution, asking the Council to discontinue the use of scavenging refuse in street making.

COMMUNICATED ARTICLE.

A SUGGESTED REMEDY FOR A SOURCE OF ERROR IN OFFICIAL PHOTOMETRY.

By Lewis T. Wright.

Despite the very large amount of attention given at various times by scientific men, either acting as individual workers or collectively in the body of commissions, to the now more than ever vexed question of gas photometry and standards of light for use therein, it is doubtful whether within the last twenty-five years much real progress has been made. In gas photometry, every effort has been made to arrive at a high degree of scientific accuracy—as witness the recent "Instructions" of the London Gas Referees; and yet, after these efforts (and many have been made), we are still beset with troublesome, inconvenient, and inexplicable discrepancies.

Of late it has been the fashion to place all these discrepancies to the evil credit of the standard sperm candle; and numerous have been the inquiries that appear to expose, with much appearance of authority, serious variations in this standard of light. That it is invariable would be too much to expect. It depends upon a complicated phenomenon of graduated combustion that is likely to be effected more or less by external influences. The writer would suggest that the methods by which its delinquencies have been exposed have not always been based upon scientific method. The candle is often compared with some other source of light supposed to be invariable, at least during the series of experiments; and it is then assumed that all the variations are due to the candle. The same inquiries could often be made use of to show that the other source of light was the guilty party, if the equally gratuitous assumption were made that the candle was invariable. It is difficult to say that we know what the extreme variations of the candle may be, or even what may be its average variations.

The simplest plan, failing some invariable standard against which the candle could be compared, would be to compare the candle against itself. If it were invariable, the light from an hourly consumption of 120 grains of sperm would be equal to that from another 120 grains of sperm burning from a similar candle in the same time. If it did not agree, we should know the extent of the variation. We should also know something about the efficiency of the sperm when burned at the various rates of consumption inevitable to this form of illuminant—a subject that, at the present time, is obscure.

The amount of light afforded by the unit normal volume of coal or other illuminating gas when burned in an argand burner at a measured rate of 5 cubic feet per hour (a rate that, owing to conditions of pressure and temperature, may not be normal), and afterwards corrected by proportion to 5 cubic feet normal—that is, as if measured at a temperature of 60° Fahr. and a pressure of 30 inches barometer—is not necessarily the same as would be obtained from the same gas had it actually been consumed at the rate of 5 cubic feet normal, because the efficiency at which the gas is consumed by the argand burner varies, with the same gas, with the mass of gas consumed in a given time; and this mass of gas of course varies in the same measured volume with every change of temperature and pressure.

The operation of photometry must be treated as a scientific one; and it loses its *raison d'être* if not so treated. Apparatus of precision is employed, and must be employed in a precise manner, on bases that are as free as possible from fundamental sources of error, and that offer a just means of comparing one result with another. The Act of Parliament ruling the case states that the gas shall be burned at the rate of 5 cubic feet per hour. It does not explicitly state that the cubic feet are to be normal for gas, as if at a temperature of 60° Fahr. and a pressure of 30 inches; nor does it say that the results are to be corrected to normal conditions. The London Gas Referees have power to prescribe "the mode to be adopted for testing and recording the illuminating power;" and they have, in prescribing the application of a correction to bring the results to normal volume (and in doing this they have only followed the practice of scientific men before them), interpreted the Act of Parliament as *implicitly* conveying the meaning that the gas volume shall be normal, and as if measured at 60° Fahr. and 30″ Bar.—at least, that appears to be the logical conclusion to be drawn from the official practice. It would have been difficult for a body of scientific men to have ignored the variations in the mass contained by the same volume of gas, due to changes of pressure and temperature, and not to have made some effort to avoid the confusion that would arise from not reducing the results to one common basis of comparison by correcting the measured volumes to normal ones.

The system of consuming the gas at a measured volume under the conditions of pressure and temperature existing at the time of the test, and then reducing the result so obtained, by simple proportion, to normal gas volume as if measured at 60° Fahr. and 30 inches, does not necessarily give the same result (and it may give a result differing from the correct one 3 or 4 per cent. either way) as would be obtained from the same gas by consuming it at the rate of 5 cubic feet normal. It does not do so because the London argand burner cannot burn different masses of the same gas in equal times at the same efficiency. No doubt

many have thought that to burn the gas at a rate that was not 5 cubic feet normal, and then to correct the result so obtained to a rate of 5 cubic feet normal by simple proportion from a knowledge of what was the normal volume, would give the same result as that which would have been obtained had the gas in the first instance been consumed at the rate of 5 cubic feet normal, when there would have been no need for any volume correction.

This view is erroneous, and assumes what must generally be known to be incorrect—that the burner is able to consume different quantities of the same gas in equal times at the same degree of efficiency. The error due to variations in the mass of gas contained in the same volume measured at different pressures and temperatures, and the inability of the burner to burn these different masses at the same efficiency, may be considerable, as the writer has pointed out on various occasions. To avoid this error—an error that allows of the same gas being reported of various qualities, according to the unavoidable variations in the mass contained in the measured volume—it is only necessary to consume it at the rate of 5 cubic feet normal; and there are no more experimental difficulties in the way of doing this than there are at present in regulating the photometer meter to make one revolution in one minute. The temperature of the gas is known, and also the atmospheric pressure; and from these data and the present table for the correction of gas volumes the rate that will have to be measured to give 5 cubic feet normal is seen at a glance.

It might be argued that, though the hourly consumption of sperm is to be 120 grains, yet, owing to an inherent impossibility, the rate cannot be absolutely controlled so as to be 120 grains, neither more nor less, and that, though the variation in the consumption of sperm is corrected by calculation, the result is not necessarily the same as though the precise quantity of 120 grains had been consumed, because the sperm, like the gas, does not burn at the same degree of efficiency when being consumed at the different rates; and since it is not possible to secure a uniform rate of combustion in the case of the sperm, there is no need to do so in the case of the gas.

There are two answers to this argument: Firstly, that in a scientific method or practice it is requisite to secure accuracy whenever and wherever it can be obtained; and though occasionally it might happen that the error in the case of the sperm might balance the error in the case of the gas, it would often happen that the two errors would be in opposite directions. Secondly, because an effort has been made already to secure that the sperm consumption shall be within certain limits, by the prescription that if the variation in the consumption be 5 per cent. either way from the normal, the result is to be rejected. Nothing of a definite character is known concerning the efficiency of the sperm candle when consumed at various rates. The prescription referred to indicates, however, that there is something more than a suspicion that the efficiency of the sperm will vary; and the consumption of sperm, to be legitimate for the purposes of official gas testing, is therefore kept within some limits. Nothing, however, is done for the gas in order to keep that within certain limits of efficiency, though it is possible, as has been stated above, to keep it, for the same gas, at the same degree of efficiency.

The foregoing remarks apply to the desirability of securing a method of official photometry that will, in different tests and under the varying circumstances likely to arise at different times, always give to the same gas the same photometric value, and not values that may differ more than half a candle one way or the other from the value it would have if tested, as it purports to be tested, at the rate of 5 cubic feet normal.

Many gas engineers require in their practice to know, within close limits, the photometric values of different qualities of gas, and desire to have a method that tests the gases at the rate of *maximum efficiency* in the burner employed. In following the 5-feet practice, it may happen that one gas is being tested at an efficiency of 75 per cent., while another is being tested at an efficiency of 100 per cent. Some of the very high values ascribed to oil gases after admixture with other gases are due to inattention to this matter.

In order to avoid the confusion resulting from adopting a constant rate for different gases, some engineers have tested gases for experimental purposes at rates that will give, in the case of the argand burner, a full chimney, or a flame that is just short of smoking-point. This practice generally brings the gases to a common basis of comparison, and is to be recommended. Another practice also adopted by the writer is to control the air supply to the argand to the point of maximum efficiency. In this manner, the same gas can be consumed in the argand at widely different rates of consumption to give its maximum efficiency. The writer believes that this method would become very popular if an argand burner fitted with delicate means of controlling the air supply could be obtained. It was found that, by thus controlling the air supply over a range of consumption ranging from 2·86 to 3·93 cubic feet, the same efficiency could be obtained from 17½-candle gas as when the gas was being consumed at the rate of 5 cubic feet without controlled air supply in the ordinary manner. (See article on "The Luminosity of Methane," in the "JOURNAL OF GAS LIGHTING," Vol. XLV., p. 435.) An advantage of this latter method is that, since the rate of consumption within wide limits is not important when the air supply is balanced to the gas supply, a flame of about 16-candle value can be obtained, and then, without altering the rate of consumption, the air supply can be controlled so as to give the maximum effect; and this can easily be found by observing the disc.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

Visit to Banbury—Presentation to Mr. C. Meiklejohn.

The Spring Excursion Meeting of this Association was held at Banbury last Wednesday; and nothing was wanting to make the day a most delightful one. The weather was fine; the surrounding country, in its spring dress, was charming; and the Chairman and Directors of the local Gas Company, with their Manager, Mr. W. R. Cooper (the President of the Association for the year), were unceasing in their efforts to ensure the comfort and pleasure of their visitors. The bulk of the members, of whom there were a good number present, journeyed to Banbury in a saloon carriage attached to the 10.20 train from Snow Hill, Birmingham. Arriving in the town, they were first conducted to the Red Lion Hotel, where, on the invitation of the President, one and all speedily testified to their appreciation of the excellent qualities of the famed Banbury cakes. The town is rich in places of historic interest; and, led by the President (who is particularly well-informed in such matters), the members visited several of them. Walking along, Mr. Cooper pointed out some good examples of ancient architecture; and by the kind permission of the proprietor, the party visited a room at the old Reindeer Inn, which was used, so it is recorded, by Oliver Cromwell for the purpose of holding his Councils during the Parliamentary and Royalist struggles in the neighbourhood. The room is in a fine state of preservation; and the exquisitely moulded ceiling and the fine panelling is of the style of the Italian renaissance. Visiting next the Parish Church, the party were astonished by the beauty of its interior; the artistic work with which it is adorned being especially striking. Leaving the Church, the members were taken to the Cross, which is a modern structure erected, it is believed, close upon the site of the celebrated old Cross.

Having completed their survey of these objects of interest, the party assembled for luncheon at the White Lion Hotel, to which they had been generously invited by the Chairman (Mr. W. Hartley) and Directors of the Gas Company and the President. Mr. Hartley presided; and he was supported by his colleagues—Mr. Jos. Saul (Vice-Chairman), Mr. H. Page, Dr. C. L. H. Pemberton, and Mr. T. E. D. Garrett.

At the conclusion of the repast,

Mr. HARTLEY, speaking on behalf of the Gas Company, gave the Association a most hearty welcome to Banbury. They were, he said, proud of their little town, and also of the gas-works. Though small, they had a Manager who conducted them exceedingly well; and the Directors highly appreciated his able and efficient services.

The usual loyal toast having been honoured,

There was, in order to save time, a little interruption in the convivial proceedings by the President calling upon the members to turn their attention to two items of business. The first was the confirmation of the minutes of the annual meeting held at Birmingham in February last; and the second, the election of four new members—Mr. Robert King, the Gas Engineer of the London and North-Western Railway; Mr. Hugh C. Lewis, of Rushden; Mr. W. A. Sapey, of Tamworth; and Mr. E. Parker, of Oakengates. On being submitted by the HON. SECRETARY, (Mr. C. Meiklejohn, of Rugby), the minutes were at once confirmed; and the members readily concurred in the proposed additions to the roll.

Continuing the toasts, Dr. PEMBERTON proposed "Success to the Association." In doing so, he referred to the electric light; remarking that there was no doubt it had many advantages from a health point of view. Its progress, however, was endangered by the incandescent gas-light, which, if it was not quite so good from the health point of view, was the best approach to it yet introduced.

The PRESIDENT, in responding, thanked the Directors for the kind and genial manner they had received the members.

Mr. H. WOODALL, in submitting the toast of "The Banbury Gas Company," alluding to Dr. Pemberton's remarks, observed that the improvements during the last two or three years in incandescent gas lighting had been such that he was assured by those who had the direction of the most profitable electric light stations in the country, that the best days of the electric light had already been seen, and that gas would encroach upon their domains in the future. Further than this, he knew, from his own experience, that a request by a town for funds for the installation of electric lighting had, after a visit by a Government Inspector, been refused.

Mr. HARTLEY acknowledged the toast, and gave the interesting information that, when gas was first introduced into Banbury—he was then a little boy—the price was 15s. per 1000 cubic feet. When Mr. Cooper took office it was 4s. 6d.; while since, through able management, it had been reduced to 2s. 10d. Considering the distance they were from the collieries, and the smallness of

their population (only about 13,000), he thought this charge compared favourably with almost any town in the kingdom.

The toasts concluded, it fell to the lot of

The PRESIDENT to discharge a very agreeable duty. Rising amid applause, he said it was a source of great pleasure to the members to think that their Hon. Secretary, with his usual amount of wisdom, had discovered the fact that it was not well for man to live alone; and they wished to show their appreciation of that wisdom by asking his acceptance of a present towards the purchase of which they had all been invited to contribute. The members had responded with their usual generosity, and had enabled the Committee to purchase a silver tea and coffee service, upon which were engraved these words: "Presented to Mr. C. Meiklejohn, on his marriage, by the members of the Midland Association of Gas Managers. June 18th, 1896." Addressing Mr. Meiklejohn, the President said: This gift, like our good wishes, is pure and unalloyed; and as your services to us have been sterling, so are our acknowledgments of them. We beg that you will kindly receive at our hands this present, which you will keep; and I am sure that every time this inscription is presented before you, you will remember the vast amount of pleasure your friends in this Association had in uniting in offering it to you. When the 18th of June comes round, some of us will be thinking of you, and will offer up this short prayer in the words of Shakespeare: "Look down ye Gods, and on this couple drop a blessed crown."

Mr. MEIKLEJOHN, who was received with much enthusiasm, said that language quite failed to express the deep gratitude he felt towards the members for their handsome gift. He did not look upon it as a reward for work done, but rather as a token of the friendly feelings they entertained for him personally. At the same time, it would be an incentive in the performance of any work that might fall in his path in connection with the Association in the future. Although the work of an official was often before the members, the success of the Association depended very much upon the individual efforts of the private members; and he hoped, when his term of official life ended, he should still be able to do something to forward the interests of the Association, which, he need not say, he had very deeply at heart. He again warmly thanked the members for their handsome testimony of goodwill, and for their kind wishes for his future life.

Without delay, the members at once mounted breaks which were waiting, and commenced a drive through the surrounding country, which, for lovely scenery and historic interest combined, it is not too much to say, is unrivalled in the Midlands. They first visited Broughton Castle (where the plot was laid against the King in 1640), and then on to Edgehill, where the battle of that name was fought between Charles I. and Oliver Cromwell. A splendid view of the neighbourhood was obtained by the members from the "Round Tower" erected on this spot. Tea was afterwards served outside the tower; and the return journey to Banbury was entered upon in time to enable the visitors to leave by the six o'clock train for Birmingham.

Circumstances had not permitted of a formal vote of thanks to the Chairman and Directors of the Banbury Gas Company for their kind attention and liberal treatment; but, directly the members were seated in their saloon carriage, a resolution requesting the Secretary to convey the members' acknowledgments was passed with as much heartiness as would have been possible in the presence of the hosts of the day.

THE SOUTHERN DISTRICT ASSOCIATION AT LEIGHTON BUZZARD.

The members of the Southern District Association of Gas Managers had one of the most enjoyable excursion meetings on Thursday in which it has been their good fortune to participate. The party, numbering between fifty and sixty, left Euston in saloon carriages attached by special arrangement to the 10.10 a.m. train; arriving at Leighton about half-past eleven. The visitors were met at the railway station by Mr. C. F. Ruggles, the Secretary and Manager of the Leighton Buzzard Gas Company, and drove through the pretty old town—a famous head-quarters of hunting men—to the gas-works, where light refreshments were dispensed. Here the party was cordially, but informally, welcomed by Mr. Frank Bassett, the Chairman of the Company, Mr. R. Richmond, the Vice-Chairman, and Mr. R. Tindall and Mr. F. Pledger, Directors. There was no speechmaking, but the group of members was photographed; and they then made an inspection of the exceedingly neat and well-designed little works, which have been rebuilt three times. Notwithstanding this tax upon the resources of the undertaking, the capital expenditure compares very favourably with that of companies of similar size; and it is a testimony to the wisdom of the Board in selecting the present site for the works, that enough money has been received for sand excavated and sold off to clear the whole of the initial cost of the land. The visitors next left in brakes for Ascott, the home of Mr. Leopold de Rothschild, who had deputed his genial Secretary, Mr. Tarver, to receive his guests. Here luncheon was served in the cricket pavilion, in the princely style of hospitality which is a tradition of the house; and it was fully appreciated after the drive through the beautiful open country in the glorious weather of this exceptional season. After a few speeches, for the most part commendably brief and to the point, the party was conducted by Mr. Tarver, Mr. Jennings, and Mr. Holbrow, of the Ascott establishment, through the exquisite grounds of this most sumptuous of English homes, over the beauties of which it would have been a delight to linger much longer than an almost too liberal programme permitted. A move was at length made to Mentmore, the seat of the Earl of Rosebery, over the noble grounds and gardens of which the party was conducted by Mr. James Smith, his Lordship's representative for the occasion. Lastly, tea was served at the Rosebery Arms at Cheddington, whence the return was made to London at the reasonably early hour of 6.49. It was in all respects a splendid outing, and a great treat to all who were fortunate enough to be able to enjoy the arrangements so perfectly made by the Hon. Secretary (Mr. J. W. Helps), in conjunction with Mr. Ruggles, to whose energy and devotion the Association was greatly indebted for what was truly a red-letter day in its annals.

SOME EXPERIENCES IN INCANDESCENT LIGHTING FOR WORKSHOPS, SHEDS, AND OPEN SPACES.

By MR. E. C. RILEY, of Swindon.

[A Paper read before the South-West of England Association of Gas Managers.]

In response to a request from our Secretary, I have prepared a short sketch of some experiences obtained in the adaptation of the Welsbach incandescent burners to the requirements of workshops and railway buildings and yards, &c. As this department of lighting experience will not be quite so familiar to many members as the lighting of ordinary dwelling-houses and shops, some of the adaptations and arrangements may present a certain amount of interest and information.

I think every gas manager who looks at the industry to which he belongs with a broad and intelligent survey of the field of operation, must at once form a strong opinion as to the really wonderful invention which has in recent years been put into our hands. Like many other good things, the Welsbach burner did not rush into public favour by leaps and bounds; and nine years since, after looking at a show installation in London, I was not at the time very strongly impressed with its advantages or general utility. The first burner fixed for trial in an office had soon to be taken off, owing to the early fracture of the mantle; and the gentleman in whose office it was fixed, declined to continue to use it, as he did not wish to be bothered with "fads and gimcracks."

For a time, my experience was confined to watching with sympathetic interest the efforts made to improve the strength and durability of the mantle, and then bring the price within the reach of the ordinary user. About three years since, further trials were made, with fairly satisfactory results; but the first installation of any consequence was in a large office with a low ceiling, lighted with regenerative lamps of the Wenham type. In this case, strong complaints had been made of insufficient light, especially when the time approached for the periodical cleaning out of the finely-divided carbon which occasionally accumulates in some lamps of this class. Complaint was also made of the great heat and defective ventilation, after these lamps had been a short time lighted. The first step was to remove the burner and glass of one lamp, and fix two incandescent burners as close as possible under the reflector; allowing the chimney of the regenerative lamp to receive the products of combustion from the two incandescent burners. The result was so satisfactory that, after a short trial, the whole of the lamps were dealt with in the same manner. Double the light was obtained; the total consumption of the office was reduced from 108 to 72 cubic feet of gas per hour; and an improved atmosphere was maintained, which enabled the clerks to do their work with much greater ease and comfort.

The next installation was in a large open-roofed engine-repairing shed, which had a clear space about 40 feet wide down the centre of its entire length. The arrangement adopted in this case was a row of pendants down the centre, 38 feet apart, fitted with two burners each, except at the ends, where three burners were used. They were fixed 16½ feet from the floor, and were covered with shallow opal glass reflectors. Between the pendants, on each side, single burners, 11 feet above the floor, were carried on long armed brackets attached to columns, some with, and some without reflectors, in order to observe the comparative result. The effect in this instance was a decided improvement on flat-flame lighting; but though the arrangement gave a fairly uniform distribution of light, yet the general appearance seemed to me too spotty. Practically double the light was obtained by this arrangement, with the same consumption of gas.

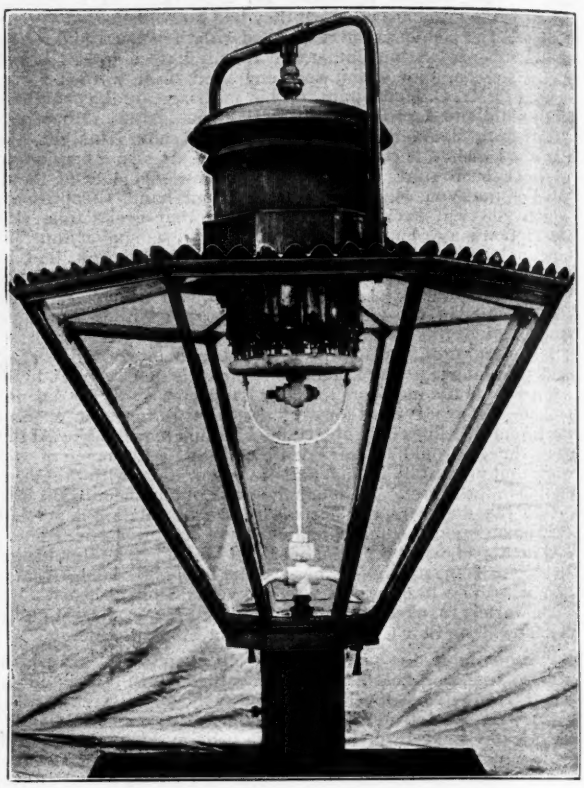
The next workshop dealt with was one which had an overhead girder travelling crane, which reached from side to side of the shop, and travelled its whole length. The method of lighting in use was with ordinary Bray burners, fitted on to a circular ring placed under a large reflector, and fixed at a height of 26 feet above the floor, so as to clear the gearing of the crane in its travels underneath. Two sizes of these rings, or sun burners, were in use—viz., one with 21 burners and the others with 14—each burner consuming 5 cubic feet per hour. A trial was made

with a cluster of 10 incandescent burners, fixed on a similar ring, with suitable reflectors, to replace the 21 burners. The result was a surprise, and the light was beyond our expectation; the reflector appearing to answer much more effectively with the incandescent than with the flat-flame burners. As we had provided a circular opening in the centre of the reflector to allow the products of combustion to pass through, the reflector itself was not injured by the heat, or discoloured by the flame, as in the case of the ordinary burner. I estimated the consumption of the 10 incandescent burners at 40 feet, and that of the 21 flat-flame burners at 105 feet, and the illuminating power, at 500 candles and 210 candles respectively. In this case, therefore, with 38 per cent. of the gas previously used, I was getting more than double the light. The result of this trial was so eminently satisfactory that the whole shop was treated in the same way—viz., 10 burner incandescent clusters taking the place of 21 burner sunlights, and 5 burner incandescent clusters taking the place of 14 burner sunlights. Other experiments still further proved that, for general overhead lighting, the cluster was superior to any other arrangement tried. Switch burners were used; and a separate pipe taken from below the main supply-cock to the burner was provided, so that the turning off of the main-cock—which was placed in a convenient position on the wall, within hand reach—simply put the whole of the burners on to the bye-pass; and all complications of rings, chains, or delicate fittings, unsuited to the rough wear and tear of a workshop, were avoided. The reflector used for the workshop clusters reflects the light at a sufficient angle to cancel any shadow which would be cast by the metal forming the bottom part of the burner; so that a soft uniform light, free from any shadow, is obtained over the whole floor area. The assistance of the reflector enables us to keep the light high enough to clear cranes and belts; and it gives less horizontal shadow than if fixed lower. This cluster lighting in many workshops is only for general purposes, as, in the case of many machines, a separate light is required on an adjustable bracket, close to the apparatus or tool in use.

Some of the members may have seen or read of an arrangement, adopted in some textile factories in Lancashire and Belgium, for obtaining a soft uniform light, free from shadows, by the agency of the electric arc light enclosed in an inverted cone-shaped case, fixed either under a white ceiling or white wood disc 10 or 12 feet diameter; the direct rays being entirely hidden, and the light reflected downwards by the disc or ceiling, according to the character of the room or building lighted. I had occasion to inspect this arrangement, but found there was considerable waste of light from the method of screening and reflection. Our experience leads us to regard the employment of incandescent clusters, fixed at a good elevation, as practically giving all that is obtained by the screened arc light, at very much less cost; as the rays from an incandescent cluster 20 to 25 feet above floor-level are sufficiently toned and diffused to remove any possibility of injury to the eyes from intense glare, and by proper spacing arrangement practical uniformity of illuminating effect is obtainable. This is assisted by the more stringent regulations of recent Factory Acts for frequent lime washing of walls, as the white walls materially assist, by their reflecting power, the general illumination.

Modifications of the cluster arrangement with opal reflectors, have now been adopted in a number of workshops, sheds, &c., with very satisfactory results. Of course, in entrance arches and positions where the light is exposed to a strong draught, a lamp would be used. I feel sure that my experience leads me to say that, with a little intelligent adaptation, the incandescent burner will be a very valuable lighting agent for workshops—especially if a little trouble is taken to make everything simple, durable, and strong, so as to stand the wear and tear of workshop practice. In one station, where over a hundred incandescent burners are in constant use—some for as long a period as 21 hours out of the 24—one of the labourers employed has been taught how to change a mantle or clean a burner; and he now does this as well as could be done by sending for the most expert gas-fitter to do the work for them.

In yards and open spaces, we had replaced flat-flame burners in lamps by incandescent ones, to the number of four in the largest type lamp; but a still more powerful lamp appeared to be required for special positions, where a good light for night working was needed. Accordingly, a lamp was made large enough to take our 10-burner cluster, as used in the workshops; and this was fixed on a post at a height of 30 feet, so as to light an important set of sorting sidings, where a large amount of night shunting was done. Here a new set of conditions was encountered, and special provisions in the construction and fixing of the lamp became necessary. In the first place, the vibration from the wind, at the height of 30 feet, was considerable in a gale; and the vibration from shunting and passing trains had also to be considered. Therefore, in order to meet this difficulty, the burners were suspended from a pipe attached to a ball-and-socket joint carried above the top of the lamp; the pipe being brought through the top of the lamp, and the baffle plates so arranged as not to interfere with the ventilation, and yet give sufficient play to allow for the post and lamp moving without interference or injury to the burners. This method of fixing also allowed the cluster to be rotated independently of the lamp, to enable the mantles or burners to be examined or changed from the lamp-door. The lamp itself, being very large (about 4 ft. 6 in. diameter), was fixed on a socket which evolved on a special casting, fixed on the top of the post, and so enabled the man when cleaning to turn it round as he required, while he stood on the small platform which was erected on one side of the lamp only. This lamp was a great success; the clear steady light, without shadow, enabling the work to be done almost as well by night as by day.



Finding this so satisfactory, the next step was to make a lamp to contain a 16-burner cluster, and stand at a height of 40 feet from the ground, so as to light railway yards in the same way as the electric arc. Three of these lamps are being fixed for trial—one supported on a wood post, and the other two on iron masts, built of angle iron with diagonal bracing. The general arrangement is similar to the 10-burner 30-feet lamp, except that provision is made to control both the main and bye-pass supply from the ground; it being found from experience with the 30-feet lamp that more injury is likely to be done to mantles by the man ascending the long ladder to light and extinguish the lamp than by the heaviest gale, as the ball and socket lends itself to counteracting the action of the wind in swaying the post better than the jerk of the man ascending or descending the ladder. In order to allow the lamp to be rotated for cleaning, and the cluster to be rotated itself independently of the lamp for examination and attending to the mantles, a separate internal supply is brought for the bye-pass in the centre of the main-pipe; and freedom is given for this bye-pass supply, so as not to interfere with the motion of the lamp in any of the particulars I have described, by the provision of a mercury seal cup, in which the bye-pass supply connection can freely move, as far as may be found necessary to meet the movement of the lamp.

The consumption of mantles in the 30-feet lamp, which has been in use since March 6, has averaged 800 hours each, with the disadvantage of the jerking of the man going up and down the ladder twice per day. The comparative economy, as compared with a number of smaller lamps, I am unable to give at present; but I think a distinct advantage will be gained by the superior elevation, at any rate for the special purpose for which they have been provided—viz., to light a large area with a small number of light centres, and yet secure a clear, steady light that gives as short a shadow as possible.

In order to meet the case of station platforms, where trains run through at great speed, a similar arrangement of carrying the burner on a ball and socket has been designed. It is found to answer exceedingly well, and can be applied to either post or bracket lamps. I know that the adaptation of such a delicate article as the Welsbach mantle to the requirements of workshops, railways, streets, &c., means a little trouble, patience, and perseverance; but the invention itself is so intrinsically good, and has such marvellous possibilities in its application and development, that I consider it is the bounden duty of gas engineers who wish to be up-to-date and keep their profession in its proper position, to be prepared to take the trouble to overcome initial difficulties, and work out for the public the

new system that has been placed in our hands. I feel it is only right and fair to acknowledge the valuable aid I have received from my Assistant, Mr. Faulkner, who has thrown himself quite enthusiastically into the working out and perfecting of details; and has made many suggestions in the construction and application of the Welsbach light.

I have had a record kept of the number and life in hours of mantles used in a large number of lamps in various positions—some very trying, from the vibration to which they are exposed—and over a period of about four months, have secured a mantle life of between 500 and 600 hours. In these instances, some lamps are found to be more destructive than others; and these will be dealt with as early as practicable in providing the safeguards and arrangements found by experience to be best for increasing the mantle life and duty, so as to endeavour to bring up the worst life to approximate to the better ones. The longest life I have recorded for any mantle was 2666 hours; and although I did not see this one before changing, I have seen one that has been in use 2500 hours, and it would then compete with the light given by an equal quantity of gas consumed in an ordinary burner. These cases, of course, are exceptional; and I do not wish to advocate the retention of a mantle so long that the light given shall be seriously or objectionably diminished. I believe it is our wisdom, and it should be our policy, while giving due weight to the question of economy, to maintain as high a standard of light as possible, so that in our friendly rivalry with our esteemed and honourable competitor electricity, we shall be contesting on the lines of "Good Light," "Pure Light," and "More of it for Everybody."

[In the course of the paper, the author mentioned that since the lamp he had described had been fixed in the yard, five large treble-burner Sugg lamps, each consuming 30 cubic feet of gas per hour, had been extinguished, as well as four single flat-flame lamps, each burning 5 cubic feet per hour—representing a total consumption of 170 feet per hour, as against a consumption of 64 feet by the new lamp, or a saving of 106 feet.]

LIGHTING BY WATER GAS.

The following is a brief abstract of the contents of a communication on this subject made by Dr. Hugo Strache, of Vienna, to the meeting of Dutch Gas Engineers at Arnheim last year. The text of the paper has lately been given in the "Zeitschrift für Beleuchtungswesen."

The subject of the paper is uncarburetted water gas, made by simply passing steam through incandescent carbon. Fahnehjelm made the first practical application of this gas to lighting purposes; and his earliest pattern "combs" gave a light of 12·6 candles for a consumption of 6·36 cubic feet per hour. These combs were tried for street lighting at Witkowitz in Austria; but the experiment proved unsuccessful. Fahnehjelm subsequently impregnated his combs with oxide of chromium, and thereby doubled the illuminating power. Such combs were successfully used for lighting in Westphalia. The first attempts to use the Welsbach mantle with water gas failed; but later a light of 105 candles was obtained for a consumption of 12·36 cubic feet of water gas per hour. A very rapid fall in illuminating power after a few hours' use occurred with both the Fahnehjelm comb and the Welsbach mantle, owing to a brown deposit on these bodies. This deposit consisted of ferric oxide, which separated on combustion of the gas from the small quantity of iron carbonyl contained in it. The maximum quantity of iron found in water gas is only 0·44 grain per 1000 cubic feet. Iron carbonyl forms on passing carbonic oxide over iron at 212° Fahr., or even at ordinary temperatures. The author devised a process for removing the iron compound from the gas by treating it with sulphuric acid; and the life of the combs and mantles was very much lengthened when only gas thus purified was employed. The cost of this purification for an installation for supplying 200 burners was only 0·34d. per 1000 cubic feet. Using the gas in a burner of improved pattern with the Welsbach mantle, a consumption of 4·77 cubic feet gave 44 candles; 6·18 cubic feet, 88 candles; and 10·6 cubic feet, 166⅔ candles. The mantles are more durable in water-gas than in coal-gas flames; and, moreover, they may be of stouter web without the light being adversely affected.

Water gas can be produced very cheaply on account of the low consumption of fuel, the little labour needed, and the small first cost of the installation. The early apparatus used required 75 lbs. of coke to produce 1000 cubic feet of gas. An experimental plant in Vienna now gives the same volume from 62½ lbs. of common coal; but it is hoped that improvements in the latter plant will nearly double the yield. The cost works out at 6·1d. per 1000 cubic feet, divided as follows: 4·52d. for fuel; 0·79d. for steam, blast, and water; 0·45d. for imparting odour; and 0·34d. for sulphuric acid. The low cost, compared with that of coal gas, is largely due to the employment of extensive pieces of apparatus instead of a considerable number of small retorts, and to less labour being called for. The consumption of fuel in a water-gas generator on slow fire is much less than that in the furnaces of retorts for making the same volume of coal gas when charges are missed. Therefore water gas is much more economical than coal gas when the make of gas varies considerably and frequently. Purification costs about the same as with coal gas. But the transport of fuel comes to less; and, owing to the ease with which the make can be varied, smaller holders suffice for storing the gas. The selling price in large towns, allowing ample for interest on capital, will be from 1s. 2d. to 1s. 5d. per 1000 cubic feet.

A number of tables showing the cost of lighting by water-gas from installations of various capacities, &c., are given; and then comes a table showing the comparative cost of lighting by various agents. The table given below is compiled from it; the Kreuzer being taken as equivalent to 0·2d., and the Hefner unit as 0·877 English candle. It shows that the heat developed in lighting by water gas is about one-twelfth that of ordinary gas lighting, and is little in excess of incandescent electric lighting. Chimneys are not needed in incandescent lighting by water gas. The risk of poisoning with water gas is not much greater than with coal gas; but, in order to detect escapes, a penetrating smell should always be given to uncarburetted water gas. Mercaptan was at first used for this purpose; but the author has discovered an agent which is cheaper and of a more distinctive and penetrating smell. Uncarburetted water gas must be present in greater quantity than coal gas to form an explosive mixture with air; and hence the risk of explosions is less with the former than with the latter.

In the course of the winter of 1894-5, two streets in Vienna were lighted with water gas according to the author's system.* The installation was eight single flame and eight triple flame lamps, and the candle power of each flame during the latter half of the trial was 180. The consumption and illuminating power were carefully checked by the municipal authorities. The gas being completely dried in the process of purification to which it is subjected, no stoppages of pipes occur through exposure to cold. In cases where it is not practicable to light by incandescence, the water gas may be made to give an ordinary luminous flame by passage through a small carburetter containing benzol. The light so obtained is, however, scarcely cheaper than a coal-gas flame.

The author concluded by saying that there appeared to be now no real obstacle to the distribution of uncarburetted water gas in towns for lighting and other purposes; and he hoped in the course of a year to be able to collect information on the actual lighting of a small town with it.

Comparison of the Illuminating Power, Cost, and Heat-Development of Various Lighting Agents.

Lighting Agent, &c.		Price.	One Flame or Light.		One Thousand English Candles.		
			Illuminating Power.	Cost.	Hourly Consumption.	Cost.	Heat Developed.
			English Candles.	s. d.	Cubic Feet.	s. d.	Calories.
Water Gas.	Welsbach light	11·3d. per 1000 c. ft.	43·85	0 0·116	100·70	0 2·65	7,127
	"	"	87·70	0 0·146	70·50	0 1·66	4,988
	"	"	166·63	0 0·220	63·60	0 1·44	4,504
Coal Gas.	Batswing burner	4s. 6d. per 1000 c. ft.	12·28	0 0·266	402·70	1 9·66	57,012
	Welsbach light		43·85	0 0·230	80·50	0 5·24	10,402
Electricity.	Incandescent lamp	100 watts, 0·75d.	16·66	0 0·374	Watts. 3021	1 10·67	4,230
	Arc lamp		1052·00	6 3·100	912	0 6·84	1,970
*Acetylene.**	Present price and quality of calcium carbide	£4 14s. 4d. per 1000 c. ft.	245·60	0 5·600	Cubic Feet. 25·40	2 4·73	8,598
	At the inventor's estimate of cost	7s. 1d. per 1000 c. ft.	210·50	0 0·450	23·35	0 2·12	9,000

* Excluding interest on capital, &c.

Death of Mr. H. Armstrong.—Mr. H. Armstrong, whose name is known to many of our readers in connection with his safety lamps, died last Tuesday, at the advanced age of 84.

* See "Journal," Vol. LXV., p. 218.

THE EFFICIENCY OF GAS-PRODUCERS.

In a paper published in the "Minutes of Proceedings" of the Institution of Civil Engineers, Mr. C. F. Jenkin discusses the means of ascertaining the efficiency of fuel-gas producers. Mr. Jenkin effects this operation by volumetric analysis of the producer gases, instead of analysis by weights. He defines the efficiency of the producer as the ratio of the heat contained in the gas as it leaves the producer, to that contained in the coal from which the gas was made. The heat contained in the gas is divisible into two portions—the sensible heat, and the heat of combustion. When the gas is used cold, the former portion of the heat is lost, and the efficiency then becomes what Mr. Jenkin calls the cold-gas efficiency; when it is used hot, the efficiency is reckoned accordingly. It is desirable to distinguish further between efficiency and what may be termed utility, meaning the whole value and suitability of the apparatus to the particular circumstances. For instance, if bye-products—such as ammonia, tar, &c.—are collected from the gas, the utility of a producer giving large quantities of such products with a poorer gas may be greater than that of a more efficient producer which gives smaller quantities of bye-products. Again, the richness of the gas produced generally determines the efficiency of the producer. Thus, in deciding upon the best form of gas-producer for any given circumstances, many other considerations besides efficiency must be taken into account.

The most direct method of finding the efficiency of a producer would be to measure by meter the quantity of gas made, and burn samples of the gas and raw fuel in a calorimeter. The direct measurement of the gas, however, is not usually possible; so that recourse must be had to chemical analysis, to find the relation between the quantity of gas made and that of fuel consumed. For determining the efficiency of a producer, it is necessary to ascertain by experiment the amount of carbon in the fuel, the amount of carbon lost in the ashes, the heat of combustion of the fuel, and the average temperature and composition of the gas. The samples of gas should be collected at intervals over a period of 24 hours, and be analyzed separately for their chief constituents. The loss in the ashes must be taken from weighings extending over four days, so as to make sure of obtaining fair results, including the loss in clinkering.

Mr. Jenkin remarks that the importance of the calorific power of the gas has been generally recognized, and that the great advantage of water gas over ordinary producer gas is its higher calorific power. This fact, which has always been insisted upon by the advocates of water gas, has been often understood to imply a higher efficiency for water-gas producers than for ordinary producers, and has given rise to false estimates of the value of water gas. Mr. Jenkin observes that, as compared with gas-producers, the efficiency of water-gas producers must be much lower; and he concludes that water gas is therefore only useful when a high calorific power is of more importance than efficiency.

The original paper gives the tables on which the author's computations are based, and cites examples to show how important a matter the efficiency of producers may be to the user.

The Federated Institution of Mining Engineers.—A general meeting of this Institution will be held at the Institution of Civil Engineers next Thursday and Friday, under the presidency of Mr. G. A. Mitchell. We learn from the programme issued by the Secretary (Mr. M. Walton Brown) that Dr. J. S. Haldane will read a paper on "The Causes of Death in Colliery Explosions." This is a subject upon which Dr. Haldane is specially qualified to speak.

Patents, Designs, and Trade Marks in 1895.—The report of the Comptroller of Patents, Designs, and Trade Marks for 1895, which has just been issued as a parliamentary paper, states that the gross receipts were £187,012, against £181,855 in 1894; and the gross expenditure being £100,671, as compared with £96,092. The number of applications for patents was 25,065, against 25,386; for designs, 21,417, against 22,255; and for trade marks, 8272, against 8013. The receipts from patents in 1895 were £168,428, from designs £3729, and from trade marks £8192.

Opening Roadways of Public Streets.—As bearing upon the subject recently discussed by the members of the South-West of England District Association of Gas Managers, on the initiative of Mr. S. W. Durkin, of Southampton (*ante*, p. 974), it may be of interest to record that the Commissioner of Public Works of New York City has issued an order that whenever an application for permission to open a street is filed, all other parties having conduits in that street are to be notified to apply for permits to do any work they have in contemplation, so that the street may be blocked for as short a time as possible. After repaving, on completion of the work, the street will not be opened again for a year, except in great emergencies. Gas companies laying mains in streets will hereafter be required to lay service-pipes to all properties abutting on the street while the main is being put down; and no permits for service-pipes will be issued afterwards.

REGISTER OF PATENTS.

Fabric for Incandescent Gas Mantles.—Moeller, J., of Palmer Street, Westminster. No. 2224; Jan. 31, 1895.

This is a modification of the Welsbach 1885 patent (No. 15,286), intended to prevent damage to the knitted material of the mantle through shrinkage on drying after impregnation.

The present specification (which is not illustrated) is in these words: "My invention relates to such a construction of fabric employed for the purpose referred to, that all parts of it are free to shrink or take shape and position independently of each other; the fabric being thus relieved from inequalities of strain, and being consequently less liable to give way than fabric woven or knitted such as is now employed. For this purpose, I make a fabric of suitable form, consisting of a number of links of thread engaging with each other like the links of a chain or chain armour, but not positively connected to each other—each link, therefore, having freedom to change its shape or position without being dependent on the changes which other links undergo. The links may be made of short pieces of suitable thread, formed into rings and knotted, after being linked into the links already formed and linked together."

Charging Gas-Retorts.—Gibbons, W. P. & B. A., of Lower Gornal, Staffs. No. 10,414; May 27, 1895.

The object of this invention is to provide means whereby horizontal retorts can be charged by gravitation from hoppers, hopper-waggons, measuring hoppers, or other receptacles, carried at a convenient height, above the retorts.

For this purpose, the patentees propose to employ, in combination with the overhead hoppers, hopper-waggons, or other overhead coal-receptacles, a shoot or spout, which by preference is inclined from the coal-receptacle towards the retorts (but which may be vertical or curved), and which terminates in a lower curved charging-shoot, having its lower open end entering or adjacent to the retort mouth. Down the shoot and lower curved spout the coal is caused to fall, so that, by the impetus thus acquired in combination with the shape of the charging-shoot, the coal will be delivered in a nearly horizontal direction into the mouth of the retort. The impetus acquired by the coal is said to be sufficient "to carry the first part of the charge to the back end of the retort, so that the pieces of coal come to rest and block the succeeding pieces; and thus the charge is delivered in an even, or almost even, stratum of the required depth all along the bottom of the retort." The inventors remark that a horizontal retort, 20 feet through, can be charged from one end with some classes of coals, and where the requisite height can be given to the shoots; but, by preference, they would charge all through retorts from each end, and place an ordinary fire-clay block in the centre of the length of the through retort—thus for this purpose converting it into two single retorts of half the length.

The illustrations show a front and a side view of one arrangement of the apparatus applied to settings of nine retorts, and made with double fixed hoppers and measuring-hoppers.

The overhead hopper is constructed with a central partition, dividing it into two compartments — namely, A for the large coal, and A^1 for the small coal or for a different kind of coal to that contained in the other compartment. The storage-hopper receives its supply of coal by (say) ordinary conveyors, the troughs for which are indicated above the hoppers. B^1 B^2 B^3 are measuring-hoppers preferably arranged on the incline, corresponding with the upper inclined shoot or spout C, and made with an inclined division-plate, dividing them into two compartments. C^1 C^2 C^3 are the upper inclined charging-shoots inclined towards the retorts, and fixed respectively to the measuring-hoppers B^1 B^2 B^3, and arranged opposite each of the three tiers of retorts, and extending from the measuring-hoppers to some little distance above the upper row of retorts E^3. The three lower curved charging-shoots D^1 D^2 D^3 are made of different lengths, to suit the different levels of the retorts; and in this arrangement, these shoots are each provided with a separate carriage. The wheels of these carriages run on rails parallel with the faces of the retorts, so that either of the three, with its charging-shoot, will be available for the corresponding row of retorts. The upper ends of the lower curved charging-shoots are made to match the lower ends of the upper ones; and the lower ends of the lower charging-shoots are made to enter the mouthpieces of the retorts.

The lower curved charging-shoots are, by preference, not rigidly fixed to their carriages, but are made moveable, so as to be withdrawn from the retort mouthpiece when the retort has been charged, and be inserted into another mouthpiece when the carriage has been moved opposite to it. This can be accomplished by the lower charging-shoot (as D^2) being carried by a small supplementary carriage, provided with wheels to run along guide-rails fixed to the carriage. There are also three slides, each made with an opening, which allows of the descent of the coal from the storage-hoppers A to the measuring-hoppers B^1 B^2 B^3, which are operated by the hand-levers G. There are also three slides (each made with an opening), which shut off the connection from the measuring-hoppers B^1 B^2 B^3 to the upper inclined charging-spouts C^1 C^2 C^3, and which are operated by the hand-levers H.

To charge the retort E^2, the measuring-hopper B^2 is filled by the hand-lever G being moved so as to bring the opening of the slide under the compartment A, and allow the coal to flow therefrom into the corresponding compartment of the measuring-hopper B^2. The movement of the slide is then continued, so that the storage-hopper is cut off by the slide, and the opening comes under the next compartment A, and allows the coal to flow therefrom to the corresponding compartment of the measuring-hopper B^2. The further movement of the slide then closes the outlet from the compartment A^1. One of the lower curved charging-shoots (say, D^2) is brought into the position shown for the retort E^2; and the charging-shoot is moved forward, so that its front end enters the retort mouth, and its upper end matches the bottom of the upper inclined shoot C^2. The slide is now moved inwardly by the lever H, so that its opening will allow of the coal passing down the upper and lower charging-shoots C^2 D^2; the latter of which will change the vertical motion of the charge into a horizontal or nearly horizontal

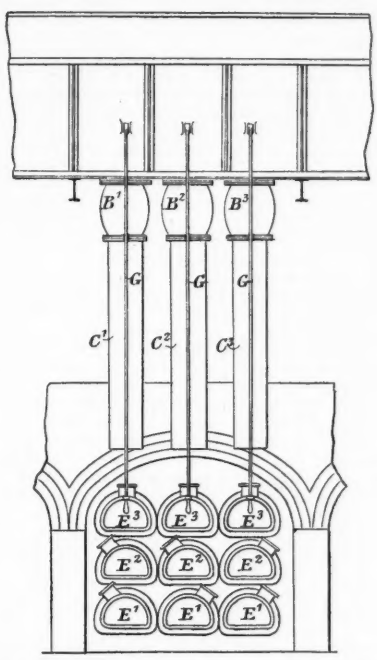
motion, and direct the charge into the retort E^3. The impetus acquired by the descent of the coal will, the patentees say, carry the first portion of the coal to the back end of the retort; and as the pieces come to rest, they block the succeeding pieces, and lie "in an even, or almost even, stratum of the required depth along the bottom of the back portion of the retort." The hand-lever H is then moved farther in the same direction, as shown by the arrow, so as to allow of the small coal being discharged down the inclined charging-shoots C^2 D^2, and be similarly delivered into the retort, and lie along the front part of the bottom of it—that is, from the large coal or first part of the charge to the mouthpiece. The charging-shoot D^2 is then moved opposite the next retort in the same horizontal row; and a charge from the storage-hopper A and measuring-hopper B^1 is delivered as described.

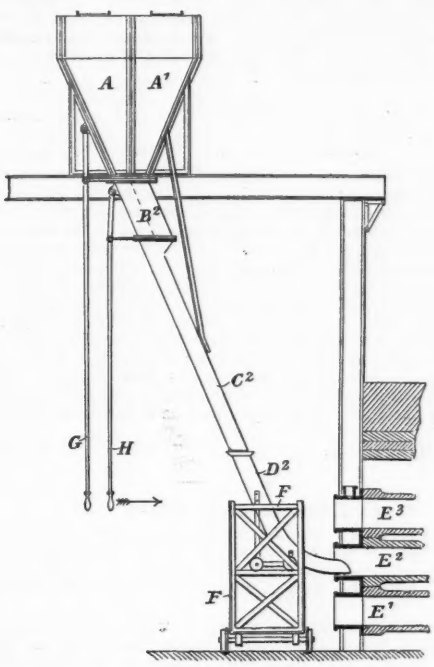
Generator for Acetylene Lamps.—Campe, R., of Berlin. No. 16,691; Sept. 6, 1895.

According to this invention, acetylene gas is generated by carbide of calcium subjected to the action of water; and the object aimed at is to provide means by which the generation of the gas is controlled in a twofold manner—so as to afford the requisite pressure in the generator and supply a sufficient quantity of gas to the burner for momentaneously developing a full flame when lighting the lamp, and, on the other hand, to perfectly and momentaneously stop the generating process when extinguishing the lamp, in order to prevent further increase of pressure in the generator, and thus remove all danger of explosion.

Generating, Storing, and Purifying Acetylene Gas.—Bayley, J. C., of Bournemouth. No. 322; Jan. 6, 1896.

This apparatus, in its simplest form, consists of a vessel inside which a float is inserted through an opening in the top, which can be closed airtight. The float is composed of two concentric cylinders, the inner





of which has an end which closes it. The outer cylinder extends some distance above the top of the inner float, so as to form a receptacle for the calcium carbide; and between the two cylinders a small annular space is left, which is filled in with a ring of woollen textile material. The whole of the float (consisting of the two concentric cylinders having between them the ring of fibrous material, and the superposed load of calcium carbide) is free to rise and fall between vertical guides; and it is borne by the weight of the water. Upon one side of the top of the vessel is placed a water-tank, so arranged with a ball-cock and an overflow-pipe that a uniform level is maintained. Upon the other side of the top of the vessel is arranged a container for lime or other purifying agent. The water entering the tank passes through a pipe to the bottom of the vessel; and, partially filling it, causes the float to rise and remain floating upon the surface with the inner cylinder immersed. The water percolating through the interstices of the porous material comes into contact with the calcium carbide; and the usual somewhat violent reaction takes place. The acetylene generated fills the upper part of the air-tight vessel, and forces back the water until a balance of pressure is obtained. The gas produced occupies the whole of the upper part of the vessel, and is conducted thence by pipes to the upper part of the container, entering it at a level higher than can possibly be reached by the water, and, being then forced downwards through the lime or other purifying agent, is conducted to the point of consumption. A frame or grating is arranged inside the vessel underneath the float, by which it can be lifted to the top of the vessel.

Lighting Incandescent Gas-Burners in Street-Lamps.—Himmel, G., of Wurtemberg, Germany. No. 5693; March 13, 1896.

The patentee points out that attempts hitherto made to utilize ordinary self-igniting or lighting devices have failed because of the sooting-up of their igniting flames; while lighting by means of an electric spark is difficult in the case of incandescent gas-lamps, and requires a powerful spark, so that the incandescent body is frequently destroyed thereby. The inventor proposes to overcome this drawback by using a bunsen burner for the pilot, auxiliary, or igniting flame, instead of an ordinary burner, which is passed through the wire cover at the top. Further, this lighting bunsen burner (or rather the continuation of it to the lamp gallery) is so arranged that the burner-top can be conveniently removed and replaced. The size of the lighting-flame is adjustable in the ordinary manner.

APPLICATIONS FOR LETTERS PATENT.

10,673.—Finch, C. A., and Ingle, H. J., "Regulating the supply of illuminating gas and enriching the same, and improved composition for such enrichment." May 18.

10,725.—Webb, G., jun., and Kelly, J. W., "Automatically generating gas." May 18.

10,728.—Swinburne, J., "Generating acetylene from carbides." May 19.

10,763.—Svoboda, F., "Siemens regenerative furnaces." May 19.

10,822.—Kirkham, H., "Scrubber-washers for removing impurities from gas." May 19.

10,830.—Knöfler, O., "Mantles or the like for incandescent gas lighting." May 19.

10,862.—Falk, S., "Mantles for incandescent gas lighting." May 19.

10,965.—Brunne, A. E., "Preparing or finishing mantles for incandescent gas-burners." May 21.

11,011.—Nehmer, H. & F., "Statical machines for lighting gas, ether, benzoline, and the like." May 21.

11,100.—Redfern, G. F., "Burners for incandescent gas lighting." A communication from J. B. P. Wanauld de Malberg. May 21.

11,106.—Catherwood, A. H., "Bunsen burners, and incandescent gas and similar lamps in which such burners are incorporated." May 21.

11,116.—Redman, T., "Street-lamps and supporting and lighting same." May 22.

11,198.—Imray, O., "Petroleum gas-lamps." A communication from Max Sievert. May 22.

11,202.—Simmance, J. F., "Coin-freed fluid-meters." May 22.

11,224.—Sellar, W. C., "Acetylene lamps." May 22.

11,227.—Wehner, C., "Stop-valves for gas, steam, and other fluids." May 22.

11,248.—Jones, F. A., and Constable, J., "Detachable flanges suitable for gas, steam, and water pipes." May 23.

11,267.—Thorp, T., and Marsh, T. G., "Producing acetylene gas." May 23.

11,268.—Thorp, T., and Marsh, T. G., "Treatment of calcic carbide for the production of acetylene gas." May 23.

11,269.—Thorp, T., and Marsh, T. G., "Charging acetylene gas generators." May 23.

11,307.—Doy, J., "Gas and oil engines." May 23.

11,327.—Williams, E. A. and J. F. C., "Retort and means for heating same." May 23.

11,339.—Gordon, T., and Swift, W. R., "Regenerative gas-lamps." May 23.

11,350.—Duncan, J. H. H., and Sugg, D. W., "Incandescence mantles for gas and vapour lamps." May 23.

Water-Works for Warsaw.—The new water-works at Warsaw, commenced fifteen years ago, have lately been completed. The city is supplied by an aqueduct 114 miles in length; and the conduits in the city itself measure upwards of 50 miles. Chiefly owing to this improved water supply, the death-rate in Warsaw has declined from 33·5 to 24 per 1000.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Estimation of Nitrogen in Coal Gas.

SIR,—As I was unable to be present during the discussion on Mr. Hunt's paper, "Notes on Residuals," read before the Institution of Gas Engineers, and reported in your last issue, I should be glad if you would allow me space in your columns for a few observations on Mr. Wright's remarks relating to the estimation of nitrogen.

Mr. Wright is suspicious of gas analyses showing no nitrogen, or as much as 10 or 12 per cent.; and as the chemistry of gas making owes not a little to Mr. Wright's researches, even his suspicions should not be disregarded. Taking into consideration, however, the many analyses published by investigators of undoubted competency, I venture to think that Mr. Wright would have done well to have brought forward something more conclusive than mere suspicion. In a paper read before The Gas Institute in 1892* the late Professor Foster gave analyses of coal gas containing from 9·71 to 13·89 per cent. of nitrogen, and of an illuminating power of from 16·6 to 18·5 candles.

Several years ago, I had similar experience. A gas of about 16-candle illuminating power upon analysis (in this case, the residual gas, after the absorbable constituents had been removed, was exploded with excess of oxygen) was found to contain 10·4 per cent. of nitrogen; a second analysis gave 10·4 per cent.; and a third, 10·8 per cent. As, however, nitrogen determinations were considered liable principally to two sources of error—viz., incomplete absorption of carbonic oxide (I prefer now to estimate this by explosion), and the possible presence of members of the paraffin series other than methane—I re-determined the nitrogen in this gas by means of Dumas' method. Every precaution was taken to get rid of nitrogen from the apparatus, and the carbonic acid used; but the results obtained—viz., 11·6 and 11·1 per cent.—were rather higher than by the explosion method. At about the same period, two samples of coal gas were taken by Professor Harold B. Dixon for analysis at Owen's College; and I was enabled to analyze similar samples at the works. The determinations of nitrogen in each case were in excellent agreement.

	First Sample.	Second Sample.
Analyzed at Owen's College	6·3 p. ct. N.	9·9 p. ct. N.
" at Windsor Street Gas-Works	6·8 "	9·4 "

With regard to the absence of nitrogen in the Brymbo coke-oven gas, I can but repeat what Mr. Hunt said—viz., that the gas left in the eudiometer after explosion and absorption of carbonic acid and oxygen was just equal to the amount of nitrogen contained in the air introduced before exploding; and I may add that this was not the case with one analysis only, but with several. At the same time, having regard to the occlusion of air by coals, I admit the impossibility of any coal gas being "absolutely free" from nitrogen. It may or may not be "an absolute natural fact" that "it would be difficult for anybody acquainted with the changes that took place in the distillation of coal to believe that it was possible, when coal was distilled at a moderately high temperature, to have a gas absolutely free from nitrogen;" but, I am of opinion, as I have stated elsewhere, that it is doubtful whether in coal gas any but traces of nitrogen has its origin from the coal itself.

Birmingham, May 23, 1896. E. LLEWELLYN PRYCE.

Thermal Adjustment of Meters.

SIR,—The interest which this subject has aroused, consequent on Mr. Fiddes's paper read at the recent meeting of the Institution of Gas Engineers, is my excuse for troubling your readers with a reference to an old patent of mine—No. 1197 of 1853, for "Improvements in Dry Gas-Meters."

In the course of the specification, among the claims advanced for the invention described, was this: "Fourthly, making the regulating cranks or tongues, screws, and other parts compensating by forming them of proportionate lengths of two metals which expand unequally—say, brass and iron—in order that the several parts may work correctly, notwithstanding they may be subjected to varying temperatures."

South Shields, May 23, 1896. W. J. WARNER.

Combining Air and Gas.

SIR,—The patent for the above-named purpose referred to on p. 1170 of the last number of the "JOURNAL" is an arrangement I have used for more than twenty years; and the system is utilized in the burners of the well-known injector furnaces, and also in the burners made by my firm for singeing fabrics and many other purposes. It is strange that a system so widely known should be patented and introduced into this country as a new thing.

Warrington, May 27, 1896. THOS. FLETCHER, F.C.S.

The Accident to the Gasholder at Gothenburg.

SIR,—Referring to Mr. Niven's letter in your issue of the 19th inst., I may remark: (1) Such an elasticity in the structure as is calculated by Mr. Niven is quite beyond my experience. On the contrary, as I have never noticed any deformations from this cause in former holders, I did not hesitate to omit, in the destroyed holder, the one angle-iron in the outer bottom curb; nor have I observed in this holder any deformation indicating want of rigidity. (2) The inner lift at least, as already stated (*ante*, p. 627), was so perfectly balanced that the weight of only one man was sufficient to tilt it over to whichever side he went.

Some other matters referred to by Mr. Niven are not quite clear to me, as I do not know the mechanical terms in English; but I note, as a point of importance, that by increasing the width of the cup, I have diminished what we call in Sweden stability in position of equilibrium.

I do not depend upon the propositions of Mr. Niven; but he has perhaps led us a little nearer to the explanation of our accident.

Gothenburg, May 27, 1896. HJ. SAMZELIUS.

* See JOURNAL, Vol. LIX., p. 1174.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS COMMITTEE ON THE LONDON WATER BILLS.

Friday, May 15.

(*Before Sir* J. PEASE, *Chairman; Sir* J. BRUNNER, *Mr.* BALDWIN, *Mr.* BOND, *Mr.* J. STUART, *Mr.* BRIGG, *Mr.* FRY, *Mr.* LEES KNOWLES, and *Mr.* MUNTZ.)

At the close of the proceedings on the clauses of the Chelsea and Lambeth Water Bills, as reported last week, the Committee passed on to consider the

STAINES RESERVOIRS BILL.

The object of this Bill is to incorporate the Staines Reservoirs Joint Committee, representing the Grand Junction, West Middlesex, and New River Water Companies, with power to acquire lands by agreement or otherwise, to construct water-works, and to take water from the River Thames, the Wraysbury River, and the Colne Brook, and to enable the Committee to issue debenture stock to the extent of £1,000,000 for the construction of the new works.

Mr. LITTLER, Q.C., who, with Mr. POPE, Q.C., Mr. PEMBER, Q.C., and Mr. CLAUDE BAGGALLAY, represented the promoters, in opening the case, said this Bill was probably, in most of its aspects, one of the most important measures which had ever been brought before Parliament in a long series of Water Bills. There was, and there had been for a very long time, an urgent necessity for a further supply of water to London; but no progress was made in the matter, owing to the uncertainty as to the result of the discussions that were taking place in regard to who were to administer the water undertakings in the future. Many suggestions had been made—some of a practical nature—which had been carried out by Parliament, with reference, for instance, to the sinking fund. But the main point he desired to make was this—that the Companies, either through the action of Parliament or owing to their own doubts, had delayed as long as they possibly could the taking of any action with regard to further expenditure or additional provisions of water supply. The learned Counsel then gave a history of the water question from the time of Sir Matthew White Ridley's Committee in 1891 to the Royal Commission who reported in 1893. The Commission, he said, had come to the conclusion that 34 gallons per head of water would in the future be required in London; and they dealt with the suggestion submitted on behalf of the London County Council that water from the Thames should be done away with, and that a new supply should be obtained from Wales. The latter proposal was as much in the air now as it was when the Commission sat. To carry it out, two Welsh counties would have to be depopulated, and 2½ millions of sheep purchased. As showing the cost of such a scheme, it was only necessary to point out that it had been estimated that legal and engineering expenses would amount to £1,600,000; while the expense to the ratepayers of London of purchasing the water undertakings, having regard to the present market value, would be £1,294,000 per annum. Then look at the risk that London would have to run! The water would have to flow through conduits; and the supply of the Metropolis might be cut off by the explosion of a packet of dynamite or by the operations of an invading army, if invasion could be regarded as a possible contingency. No doubt Welsh water would have its merits; but clearly the scheme was one which would take a long time to mature, and which deserved the careful consideration of Parliament. On the other hand, the one which the promoters of the present Bill put forward was to supply what they believed to be an immediate want. The Royal Commission, reporting on the suggestion made to them in favour of the construction of storage reservoirs at Staines, said that, by a combined process of sinking and raising, a depth of 40 feet would be obtained; the digging being entirely in gravel which was found to overlay the clay to a depth of from 20 to 30 feet. Water-tightness was to be secured by forming vertical puddle-walls in the hearts of the banks, carried down by trenches into the clay below; the internal slopes being protected from wash by a concrete lining. This was a common and effective method of construction in such situations; and there could be no doubt that perfectly safe, sound, and satisfactory reservoirs could in this way be ensured. One advantage rightfully claimed for the scheme was that it could be carried out by instalments as might be required by the increase of population. The complete scheme was intended to provide for the taking of 300 million gallons a day for supply, and leaving 200 million gallons to flow over Teddington Weir. The promoters assumed this quantity would not be needed until 1941; and that, to secure it, 12,526 million gallons of storage would be required. The water to be stored would be taken from the Thames above Staines. The levels would admit of its flowing in partly by gravitation; but mainly it would have to be pumped, as the top water-level was to be 80 feet above the Ordnance datum. From these reservoirs the water would gravitate through cast-iron conduits, constructed in the clay, to filter-beds at Hampton and Molesey; but when occasion arose in the future, the filtering could be done at Staines, either through the natural gravel or through artificial beds, as might then be deemed best. It was proposed that no water should be taken from the river during the first fifteen days of any flood. Broadly speaking, and without committing themselves to details, the Commissioners said that the conception of this Staines scheme of storage commended itself to them as the best which had been suggested. It affected but a short run of the main river, and none of the tributaries; it could be carried out by stages, as the demand for water increased; and it could be

delayed or stopped entirely, as circumstances might dictate in the future. The proposed sites for storing the water of the Thames at Staines were, from a geological point of view, quite unobjectionable. They lay upon the alluvial plain of the river. The promoters of the Bill included in their proposal a clause to compel them to surrender any land they might acquire, if Parliament should not hereafter authorize the making of additional works upon it; the land to be given up at a certain time and under certain conditions which it was not necessary for him to go into then. The Bill proposed the construction of two reservoirs to hold 2500 million gallons of water. As showing the immediate necessity for the Bill, the learned Counsel pointed out that one of the parties to it—the New River Company—were within 2 million gallons per day of the end of their supply; and the other two Companies were filling up with exceeding rapidity. The position of the West Middlesex Company was not so bad, because they had provided new reservoirs; but though they had these, they had not the water to put into them. As to the need of new water supplies in London, it was only necessary to recall the experience of the East London Company. Not long ago, they asked for further storage powers, and for one year Parliament rejected their appeal, on the ground that it was unnecessary to extend their powers until this water question was settled. And what happened? Why, the very next year there was an absolute water famine in London.

The CHAIRMAN: In 1894 we gave the East London Company large powers for the construction of new reservoirs.

Mr. LITTLER acknowledged that this was so; but he pointed out that the Company had asked for the powers the year before. A year's delay took place; and, the Company being unable to complete their reservoirs, serious consequences were suffered both by them and the consumers. An independent inquiry was held by the Local Government Board into the causes of the water famine; and it was conclusively proved that the fault did not lie with the Company, who had not sufficient storage. Counsel proceeded to explain that the Bill would constitute a Joint Committee consisting of three members from each of the three Companies; and it was proposed to make these gentlemen, as it were, trustees (to the Companies and their consumers) of these reservoirs. They would be empowered to raise money for the work at 3 per cent. or less. Each of the Companies would pay £10,000 a year to the Committee; and the money would be apportioned in a manner provided by the Bill. Having described the character of the works and the provision regulating the intake, he went on to refer to the petitions against the Bill; pointing out that certain of the bodies who had lodged objections to the scheme had withdrawn from active opposition. The Middlesex County Council, he said, were petitioning; and they were represented by Lord Robert Cecil. The Staines local authorities were also petitioning; but they had reserved the names of their Counsel, as also had the Great Western Railway Company. For the rest, the London County Council was represented by Mr. Balfour Browne, Q.C., Mr. Worsley Taylor, Q.C., Mr. Freeman, Q.C., and Mr. Kemp; the Thames Conservancy Board, by Mr. Fletcher Moulton, Q.C., and Mr. Fitzgerald; the Corporation of the City of London, by Mr. Melvain, Q.C., and Mr. Rigg; and Mrs. Jenkins, by Mr. Batten. He then went through the various allegations set forth in their petitions.

At the conclusion of the learned Counsel's address, the Committee adjourned until the following Tuesday.

Tuesday, May 19.

On the resumption of the proceedings to-day,

The CHAIRMAN asked for a statement as to the quantity of water taken from the Thames by the three Companies, the quantity they were empowered to take by their agreement with the Thames Conservancy Board, and the amount of money paid to that body.

Mr. MOULTON, Q.C., said the statement should be prepared.

The following evidence was then given for the promoters:—

Mr. *E. Boulnois*, M.P., the Deputy-Chairman of the West Middlesex Water Company, and a member of the London County Council, said he was well acquainted with the position and resources of his Company, and their requirements with respect to water. He had taken an active part in the consideration of the questions now before the Committee, and could say that there was an urgent necessity for further powers. In 1894, authority was obtained by the West Middlesex Company to construct two new reservoirs; and since then one had been completed. But it could not be made use of, for the reason that the Company had no water to put into it. It was, therefore, very desirable that the Committee should grant the powers now sought. His Company had been in communication with the New River and the Grand Junction Companies on the question of the acquisition of a further supply of water; and he understood that they were all agreed. It had been stated to him that these Companies were almost at the end of their resources. The West Middlesex Company were paying 10 per cent. on their shares, and had been doing so for some years. They had not received all their back dividends; and he did not know that they were likely to do so. But just as though they had paid them off, they had been allowing a reduction in the price to the consumers for some years. They had begun by allowing a discount of 5 per cent. After two or three years, this had been increased to 7½ per cent.; and now the discount was 10 per cent. Under these circumstances, the proposed works would not benefit the shareholders of the Company pecuniarily. All the advantage which would be gained would go to the consumer. As far as the shareholders' interests were concerned, they would be quite prepared to let the matter rest; but powers were now sought to satisfy the consumers in a large and increasing district, and to carry out the Company's statutory obligations.

Cross-examined by Mr. KEMP, witness said that for some years to come his Company had no hope of increased profits.

By the CHAIRMAN: The whole of the West Middlesex Company's supply came from the Thames; the quantity being limited to 24½ million gallons per day.

Mr. *F. Tendron*, the Chairman of the Grand Junction Water Company, and a member of the Thames Conservancy Board, said that, in his opinion, a further supply of water was absolutely necessary to his Company.

Mr. BAGGALLAY: You could not get on without it?

Witness: If I may answer that in my own way, I will say that, as this scheme will involve a heavy charge on the Company, from which they can expect no return, we should certainly not seek to carry out these works unless they were absolutely necessary. If it were not our desire to benefit the public, we should be adverse to this scheme.

Having regard to the instruction to the Committee, in your opinion could the works proposed be delayed with prudence?—I say "No."

The interest of the public requires that they should be carried out?—Yes; the interest of the consumer. Our Company have not yet reached their maximum dividend. Last year, owing to the frost, the action of the County Council, and other circumstances, it was only 6½ per cent. This year it will be 7½ per cent.; but the year before we were harassed, it was 8½ per cent.

By the CHAIRMAN: Their water was taken from the Thames and from the gravel running in the same direction as the river. The quantity of water they took from the Thames by agreement with the Conservators was 24 million gallons per day; but the Company had reason to believe that they had a right to an unlimited supply from that source.

By Sir J. BRUNNER: The 24 million gallons were drawn direct from the Thames; but they could take an unlimited supply from the gravel.

Mr. *R. Middleton*, M.Inst.C.E., was then called to give details as to the scheme. He said that he had for many years been interested in the question of water supply. He had been engaged as Assistant Commissioner to the Commission on the Metropolis Water Supply which sat in 1892 and 1893. At the request of the Commission, he had made a great many gaugings in respect of the Thames and Lea Valleys; and he had made himself acquainted with the operations of the London Water Companies. He believed that increased supplies were absolutely necessary for the West Middlesex and Grand Junction Companies. Without increased storage, the amount of water required to be taken from the Thames would be such as to reduce the quantity flowing over Teddington Weir below 200 million gallons per day; and that, in the opinion of the Thames Conservancy Board and other high authorities, would be a dangerous thing to do. In 1875, the average daily supply of water by the West Middlesex Company was 9,765,000 gallons; in 1885, it was 14,068,000 gallons; and in 1894, it was 19,062,000 gallons. The average per day during the highest month in the year was, in 1875, 10,732,000 gallons; in 1885, 16,608,000 gallons; and in 1894, 21,403,000 gallons. The average daily supply of the Grand Junction Company was, in 1875, 10,884,000 gallons; in 1885, 15,572,000 gallons; and in 1894, 18,396,000 gallons. The daily average during the highest month was, in 1875, 12,524,000 gallons; in 1885, 18,114,000 gallons; and in 1894, 20,208,000 gallons. The average yearly increase of the West Middlesex Company was 3·63 per cent.; and of the Grand Junction, 2·86 per cent. The increase had lessened of late; but it would go on increasing, because the rainfall had been less than formerly, waste had been greater owing to the transition from an intermittent to a constant supply, and for other minor reasons. He had calculated the probable requirements in the future up to the year 1910. When the new reservoirs of the West Middlesex Company were completed, they would have a total storage capacity of 468 million gallons, which was equal to 24½ days' supply calculated on the average daily supply of 1894. The storage capacity of the Grand Junction Company was 64 million gallons, which was equal to 3·73 days' supply calculated in the same way. By agreement with the Thames Conservators, the Companies were limited to an intake of 24½ million gallons each from the river per day of 24 hours. It would take from 86 to 181 days to fill the reservoirs of the West Middlesex Company; and from 10 to 15 days to fill those of the Grand Junction Company. He calculated that the proposed works would take till 1901 to construct; and the provision which would then be made would suffice until 1911, by which time the West Middlesex and Grand Junction Companies would require 85 million gallons, in addition to 20 million gallons which would be supplied to the New River Company. The New River Company's total supply at present was 45,800,000 gallons, taken mostly from the Lea, and the Chadwell spring and wells. Witness went into figures to show the deficiency in the supplies of the three Companies in the future if further powers were withheld from them. The proposed works would only be just sufficient for ten years, if at the end of that period they had as bad a year as they had in 1893. The new reservoirs would contain 2500 million gallons; and such storage space was required in the interest of all three Companies, if the requirements of the public were to be met. There was no doubt that the works could be carried out more economically by a combination than by each Company acting separately, and that large reservoirs were, in the long run, less costly than a number of small ones. The scheme now before the Committee was an instalment of the proposal submitted to the Royal Commission, and reported on by them in 1893; this proposal involving works which could be undertaken by degrees, as the demand for water increased. The construction of nine new reservoirs was contemplated, which would supply the needs of the Metropolis up to the year 1931. It was not intended in any way to interfere with the existing powers or works of the Companies. Describing the works proposed by the Bill, witness said that the average daily amount of water which would be taken from above the Bell Weir at Staines would be 39 million gallons. There was no restriction in the Bill as to how much water might be taken; the only stipulation being that 200 million gallons must be left behind to flow over Teddington Weir per diem.

Mr. BAGGALLAY stated that an agreement was in process of being arranged for the limitation of the amount of water to be taken.

Mr. BALFOUR BROWNE said he supposed this meant that more money would be paid and more water taken.

Sir R. WYATT, Parliamentary Agent, denied that any agreement had been entered into between the Companies and the Thames Conservancy Board.

Mr. BAGGALLAY said they would assume, then, that no negotiations were in progress.

Witness (continuing) stated that the amount of water which would be taken from the river under the Bill would, in ten years, amount to 22,357 million gallons. Water would not be abstracted in time of flood. General Scott, in his report to the Government, had declared

that water should not be taken at such periods, nor for several days after a flood. The first part of a flood brought down the scourings of the river bed and its tributaries; and for this reason the water was not fit to be used. To his mind, the water should not be taken till seven or eight days after the subsidence of the flood, or until the amount of water flowing over Bell Weir had sunk to 240 million gallons per day. In proximity to the new reservoirs, there were a cemetery and a sewage farm; but as both of these were on a lower level than the bottom of the reservoirs, they could not possibly pollute the water. Besides, it was of the essence of the case that reservoirs should be absolutely water-tight. There was provision made in the Bill for the construction of a conduit from the proposed works to the Chelsea Company's reservoirs.

Mr. BAGGALLAY said that it had been originally intended that the Chelsea Company should be supplied with water; but this part of the Bill had been abandoned.

Mr. BALFOUR BROWNE: Oh! there were at first four partners to this Bill, but now there are only three.

Witness (continuing) stated that there was no question of the Thames water being suitable for the purposes of this scheme; the only thing it was essential to provide against being the abstraction of water when the river was not sufficiently full. The London County Council stated, in their petition, that there was no provision for the discharge of compensation water into the Thames; but that was not necessary. No water would be taken when the river was low; and, as a matter of fact, the operations of the Joint Committee would improve the river rather than injure it. The Thames was not a river along which there were mills and manufactories worked by water power; so that it was not necessary to provide for compensation water.

In cross-examination by Mr. BALFOUR BROWNE, witness said that the object of conduit No. 6 (which joined the Chelsea Company's works) was to supply water through the Chelsea Water-Works for the use of the New River Company. The Chelsea Company had not contemplated taking water from the Joint Committee; but his original design had contemplated the supply of water to six of the Metropolitan Water Companies. He admitted that the accuracy of his figures depended upon the amount of water per head which was necessary for the population.

Mr. BALFOUR BROWNE pointed out that the Grand Junction Company had claimed to possess sufficient water to supply the population within their area for some years to come. In the same way, the New River Company, in the appendices to the Report of the Royal Commission, claimed to have enough water for their district for more than forty years; and the West Middlesex Company had contemplated the taking of a much larger quantity from the Thames, without the provision of further storage works. (To witness) Is all this now to go by the board?

Witness: I do not say so. So far as the West Middlesex Company are concerned, there is nothing to prevent them taking a large amount of water from the river without injury to any interests.

Mr. BALFOUR BROWNE said the Royal Commission believed these statements, and had adopted the Company's figures as their available amount of water. He asked if 48 gallons per head per day was an excessive amount for any one of these Companies to supply?

Witness said he should not think of allowing 48 gallons per head. He thought that 48 gallons should be regarded as the maximum and 35 gallons as the average. The Royal Commission had taken the figures of the supply of the Grand Junction Water Company as 48·2 gallons in 1893 and 48·6 gallons in 1894. He certainly would not undertake to say that 5 gallons per head per day could be saved on the supply of the Grand Junction Water Company. If 5 gallons per head per day were saved out of the supply of each of the three Companies, it would postpone the necessity for new powers for 14 years. He could not say how much could be saved by each of the Companies as the stoppage of waste was a difficult thing to estimate; but he thought that there was no reason to be stingy with the supply of Thames water. No doubt, steps should be taken to prevent waste, but not beyond the point at which it becomes cheaper to supply more water than to stop waste.

Wednesday, May 20.

On the opening of the proceedings to-day,

The CHAIRMAN said the Committee had decided to adjourn at the end of the day's sitting until June 4. He took occasion to point out to Counsel that what the Committee had to determine was what part of the work contemplated by the promoters could not be postponed without detriment to the public. It was, therefore, necessary that they should have before them the evidence of the Companies who were supplying the water. They wanted to know what the experience of the Companies had been during the past two or three years, as to the quantity of water it was necessary to supply; and then they would have to judge whether the amount of water the Companies had in hand—which was not inconsiderable—was sufficient for the present requirements. It was clear that Mr. Middleton, able man as he was in regard to the proposed works, had not been very much a water engineer in the ordinary acceptance of the term—that was to say, in connection with the daily carrying out of a water supply. He (the Chairman) would suggest to Mr. Balfour Browne that he should leave over the cross-examination of the witness as to the water undertakings of the Companies until they had heard the engineers who were connected with the existing works.

Mr. BALFOUR BROWNE replied that he would have to cross-examine Mr. Middleton to some extent, as he was put forward as engineer to the scheme. He would get the facts from him which the Committee had in their mind.

The CHAIRMAN said the learned Counsel would get the facts from Mr. Middleton in a philosophical way, and not in the practical manner in which the Committee desired to have them. He did not ask that cross-examination should be curtailed on the works part of the Bill; but the reason for the works would come better from other witnesses.

Mr. BALFOUR BROWNE said his object was to lay the facts before the Committee.

Mr. *Middleton* was then further cross-examined by

Mr. BALFOUR BROWNE, who was proceeding to question him as to the amount of water which should be provided for per head of the population, when

The CHAIRMAN said the point might be dealt with as affecting each Company separately. They knew that anything above 40 gallons per head was something which required examination.

Mr. BAGGALLAY: Other than the lands required for the reservoirs and the pumping-stations, what is the reason for including in your scheme what you call "additional lands?"

Witness: We desire to acquire these lands because they are more or less convenient, and can probably be obtained now for a smaller sum than will be possible in years to come.

You wish to secure the land now rather than run the risk of being cornered at some future time when you may want it for additional reservoirs?—Yes. We have before us evidence for acting promptly in these matters. Since this scheme was contemplated, parts of the land we desired to utilize for the reservoirs have been acquired for the purposes of a cemetery and a sewage farm. Furthermore, in a corner between the two reservoirs, there has been a considerable amount of building going on. For the proposed reservoirs, 389 acres of land are taken; and the additional lands will amount to 1288 acres. The cost of the land, pipes, and so forth, will be £885,000.

Witness, in answer to Mr. BALFOUR BROWNE, proceeded to point out how the present scheme differed from that put before the Royal Commission. The main points of difference were that the present scheme did not provide for filter-beds, and that it included an open conduit for the flow of water from Staines to the Companies' works—a distance of eight miles. He did not anticipate difficulty from ice in the open conduit; believing that the fall was sufficient to enable them to maintain the flow of water. A further difference from the original scheme was that it was now proposed to supply only three Companies with water from Staines, instead of six. With regard to the use of river water, several large towns he knew had given up that source of supply; but he imagined that this was largely due to the rivers becoming unusable. He was not aware of any scheme in which the whole river was taken for the water supply of a town. It was customary—as in the Manchester, Birmingham, Glasgow, and Bristol schemes—to impound the flood waters of rivers; and this was practically what would be done in the present scheme. No compensation water, however, was provided for in the Bill. They proposed to leave a flow of 200 million gallons per day over Teddington Weir, when that was possible; but they would be unable to add to the summer flow.

Mr. BALFOUR BROWNE: Is it not always the case that compensation water is provided for in these schemes?

Witness: Where the whole river is taken.

What is the object of refraining from using flood water?—So as not to take the scourings of farmyards and the streams that carry away those scourings. I presume that the promoters will be in telegraphic communication with stations along the river; and knowing when a flood is coming, they will avoid taking the flood water.

How do you know that the water supplies of the three Companies will be exhausted in 1901?—On the average of figures given to me. The maximum daily supply of the New River Company is 45 million gallons, and the average 38¼ millions. The average of the West Middlesex Company is 23 million gallons; the maximum being 28 millions.

The CHAIRMAN said these facts would come better from the engineers to the several Companies.

Mr. BALFOUR BROWNE: This scheme, to come within the direction to the Committee, must be one which will take five years to carry out. If it could be completed in three years, it could be postponed until 1898, could it not?

Witness: No; because the Companies will all be in difficulties before that year.

We started with the proposition that your scheme was to supply water between 1901 and 1911, when you say all their resources would have failed?—Yes.

If so, it would be time enough to begin these works, provided they can be carried out in three years, in 1898?—That would only be postponing the thing one year.

But it would be postponing it until after the new Water Authority comes into power?—As a matter of fact, the West Middlesex Company will be out of water, or drawing beyond the amount they are allowed to do, next year.

Then you will not be ready for them?—No.

This scheme is not to supply that deficiency?—As soon as we can make it ready we shall.

Is this scheme the smallest possible instalment you can make?—Yes; for ten years.

But could you not make one reservoir?—If we did, it would be absolutely useless.

If carried out, how would this scheme affect the purchase price of the Companies' undertakings?—I should think it would reduce it.

Do you believe a company at the end of their resources would fetch as much as one that had storage for ten or fifteen years ahead?—I think so, when you take into consideration that they have to spend a large amount of money on their works which for some time will be unremunerative.

How much will this scheme cost?—£180 per million gallons of water stored. The two reservoirs will cost £435,116, for works and land. The conduit will cost £95,000, from Bell Weir to the end; the road crossings and accommodation works being extra. The additional land and land for conduits will cost £119,480.

The CHAIRMAN: That is a long way short of £894,000?

Witness: Yes; but machinery costs £36,000, and reservoir No. 2 at the eastern end of the conduit £40,000.

In reply to Mr. BALFOUR BROWNE, witness said it would not be necessary to remove the deposit from the reservoirs very often. He did not think there would be 2 or 3 feet of deposit in ten years; it would probably not amount to more than as many inches. Of course, if there were that amount of deposit, it would have to be removed; but this could be done at a period of the year when the water supply to the consumers would not suffer. It was likely that 100 million gallons of water would be taken every day; but the average he had estimated was 35 millions, which would keep the water in the aqueduct at a depth of 5 feet, flowing at 1·4 miles per hour.

Mr. BALFOUR BROWNE: I understand 200 million gallons per day is the highest dry weather flow of the Thames over Teddington Weir?

Witness: No; it has gone to 187 million gallons on an average, though it would be much lower than that on a single day. In 1893, it never reached 200 million gallons. I do not think the flow would be interfered with. I should not agree with anyone who said that the scheme would multiply the days of dry weather minimum flow over Teddington Weir by four, so that where at present the flow is below 200 million gallons on 20 days in the year, it would in the future be under that amount for 80 days.

By Mr. MILVAIN: It was proposed, under the scheme of the promoters, that no water should be taken at flood time; but they would have to abstract the water if their reservoirs were low when the river was at a minimum flow. No doubt the effect of the scheme would be to diminish the flow of the river at Teddington, and increase the sewage at Barking and Crossness; for the water taken would be for domestic use, and the bulk of it would in the end find its way into the sewers.

By Lord R. CECIL: The area of the reservoirs and additional lands would be 1900 acres; and some of it was very likely to be built on in the future. If it was occupied by buildings, it would be of much greater value for rating purposes to the County Council than if it were covered by water. There was a large amount of land in the neighbourhood, however, which could be used equally well for building purposes, without taking that which the promoters sought power to acquire.

In re-examination by Mr. BAGGALLAY, witness said that under the present scheme water would not be taken from the river until at least 350 million gallons a day were flowing over Teddington Weir, including the quantity abstracted by the Water Companies who at present had power to take Thames water. The scheme would not interfere with the tidal scour of the river; and, as to the impurity of flood water, even if a quantity were taken, it would be filtered before distribution, and would reach the consumer as pure as any of the water now supplied. The intake would be above the town of Staines; and, as was well known to all London water engineers, that town had been one of the great difficulties in the way of the purity of Thames water, owing to its being one of the main sources of pollution. With regard to the supply of compensation water, arrangements of that kind were only made where the whole of a river was impounded; and the quantity of the compensation water would depend, of course, upon the number of mills and manufactories affected. He did not think that provision could be made in the Bill for the construction of the works within the next three years without risk of being unable to supply the water at the end of this period. It would be safer to arrange for carrying out the works by the year 1901. The fact of there being two new reservoirs, would enable the promoters to run one of them off for cleansing purposes without stopping the supply. He denied that the flow of the river or its scouring properties would be injured by this scheme, or that the proximity of the sewage farm and cemetery to the new reservoirs would pollute the water in the least degree. On the question of waste, he pointed out the various means by which water was lost without serving a useful purpose, and by which abnormal quantities were used. There were no means of ascertaining the quantity so wasted; and the Companies, by their present powers, were unable to prevent it, or to establish efficient inspection.

Sir J. BRUNNER said he desired to have some information as to the extent to which common lands would be interfered with by the proposed scheme.

Mr. *W. Hunter*, M Inst.C.E., Engineering Director of the Grand Junction Water Company, said that for the past 35 years he had been engaged in the designing of water appliances and the management of water-works; and had been associated with Mr. Fraser in the framing of the Staines scheme which had come before the Royal Commission of 1892-3. He was of opinion that a large quantity of water could still be abstracted from the Thames for purposes of consumption, without in any way interfering with its pleasure or health characteristics. The scheme which he had submitted to the Royal Commission contemplated the ultimate construction of reservoirs capable of holding 18,000 million gallons of water; but it was capable of being carried out in instalments, as the requirements of the time necessitated. The complete scheme would provide storage capacity sufficient to last until 1931. He considered the proposed works were absolutely necessary to enable the Water Companies who were parties to the scheme to fulfil their statutory obligations—unless they were prepared to break the law and their agreements, and take water from the Thames without parliamentary or other sanction. At present, the Grand Junction Company, by agreement with the Thames Conservancy Board, could only take 24 million gallons of water per day from the river. He had made an estimate as to the amount of water which would be required in the future, and had based it upon the maximum daily supply It was necessary to estimate on that maximum supply, so as to be able to provide for the exigencies of a severe frost and a long drought. In 1895, the average supply of the Company was 19,219,000 gallons per day. The maximum supplies were, in the week ending June 29, 22,250,000 gallons a day. On June 27, it was 27,072,000 gallons, or within 400,000 gallons of the maximum take from the river.

Mr. BAGGALLAY: When will you require an additional supply?

Witness: Our maximum supply in 1901 will be 26,210,000 gallons a day, or an average of 22,595,000 gallons; for 1911, the maximum will be 32,732,000 gallons, or a daily average of 28,244,000 gallons. In taking these two periods, I do it because the works cannot be completed until 1901, and are designed to make provision up to 1911. Unless we have further powers of obtaining water, we cannot meet our obligations from an intake at Hampton. Of course, we could increase our supply from Hampton if we had greater storage capacity; but it would be infinitely better to construct reservoirs at Staines, where the land stands high, and has alluvial soil on the surface and a clay bed. The site of the proposed reservoirs is an admirable one; and it will be a great advantage to take the water from the other side of the town of Staines, which has always been a serious difficulty from the point of view of the purification of the Thames water.

Witness further stated that he had calculated that in ten years the requirements of the Grand Junction Company would increase by 25 per cent. He agreed that the Thames water should not be taken during the firs days of flood. It was, of course, to the interest of the Companies not to take the water at such times.

Mr. BAGGALLAY: As to the flow of the river, assuming that no water is taken at Staines when less than 250 million gallons per day are flowing over the Bell Weir, will there be any effect produced in the minimum flow over Teddington Lock?

Witness: None whatever.

Cross-examined by Mr. MILVAIN, witness denied that the operations under the Bill would injuriously affect the flow of the river. The reservoirs would only be filled when there was plenty of water running down the river. The average quantity of water which would be taken from the reservoirs would be 25 million gallons per day; and the flow or scour of the river would be diminished, and by this amount the sewage at Barking Creek increased. The Grand Junction Company contemplated taking one-third of the water which would be secured under the Bill.

By Mr. FREEMAN: He thought that a great deal more water might be abstracted from the Thames than was taken at present; and on this point he was supported by the report of the Royal Commission, in which it was stated that 200 million gallons could be abstracted. The two reservoirs had been altered in form from what had been originally intended, in order to avoid a cemetery and a sewage farm; but these would not prejudice the reservoirs, being on a lower level. He had had no experience of constructing reservoirs, adjacent to a cemetery or a sewage farm. He understood that at times of flood part of the route of the proposed conduit had been 5 feet under water, and another portion 8 and 9 feet. It was proposed to take water from the Wraysbury Brook; but he had not heard of the fish in that stream being seen lying dead in it, owing to the foul state of the water. Asked how he accounted for the fact that before the Royal Commission a statement was made to the effect that the Company's existing resources were sufficient for their wants, witness said that engineers, like other people, were liable to make mistakes. The late Engineer in this case must have made a mistake. No doubt there was a great discrepancy between the late Engineer's statements and his (Mr. Hunter's) evidence; but, as a matter of fact, since the Royal Commission reported, he had gone thoroughly into the figures. A great deal was done by the Grand Junction Company to keep down waste, and with some amount of success; but still the loss by this means was enormous. The Company's circumstances were exceptional; and to this he attributed the large amount of water per head of the population that was supplied.

The Committee adjourned until June 4.

The Resignations in the Hull Water Department.—The Water Committee of the Hull Corporation met at the Town Hall on Friday, the 22nd ult.—Alderman Massey in the chair. After the disposal of the general business, the Committee sat in private. It subsequently transpired that the resignation of Mr. B. J. E. Bruce, the Water Engineer, to which reference has been already made, was received and accepted. The resignation will take effect from the moment Mr. Bruce's successor is appointed; and he undertook to render all assistance in his power to the Committee. After some discussion, the Committee unanimously decided to recommend the Council to grant him the sum of £400, being equivalent to a year's salary, on his retirement from office. About 160 applications for the office, and 88 for the minor posts which have become vacant, have been received.

Stafford Gas and Electricity Supply.—At the last quarterly meeting of the Stafford Town Council, the Gas and Electricity Committee in their annual report stated that for the first nine months of the past financial year the consumption of gas increased; but during the last three months, owing to the mild weather, this was considerably checked. Consequently, the profits on the works (which are under Mr. J. F. Bell's supervision) had not been so large as was expected. But they had made a gross profit of £7056. Out of this payments had been made for interest and redemption of loans. The net profit was £1591; and the Committee recommended that £1500 should be handed over for the reduction of the rates. They stated that the use of gas for cooking was steadily increasing; and they hoped not to have to report any decrease of consumption on account of the electric light. With regard to the latter, they reported that everything was satisfactory—no hitch whatever having occurred; and the number of consumers was increasing. The report was adopted.

The Loss on the Teignmouth Gas-Works.—A further contribution to the interminable discussion on the position and management of the Teignmouth Gas-Works took place at the meeting of the District Council last Tuesday. Mr. G. H. Jarvis, who keeps an ever-watchful eye upon the works, was as usual to the fore; his complaint this time being that the quality of the gas was inferior and the pressure too low. The bad quality he attributed to the use of Scotch coal. They were having common Scotch coal at 9s. per ton, when they could get Newcastle coal at 7s. 3d. per ton. This meant a loss of £200 a year; and there was scarcely a town round the coast, from Plymouth to London, which used only Scotch coal. They never, he added, got into such a bad financial state when they had Newcastle coal. The Chairman (Mr. T. W. Hutchings) replied that the Manager's report showed that Scotch coal yielded 1000 cubic feet of gas per ton more than Newcastle coal; and Scotch coal had been supplied for the last two years because the Manager stated that without it he would not guarantee to provide the town with gas during the winter. He (Mr. Hutchings) could not understand the continual criticism of the gas-works. Since Lady-day, 1888, a sum of £5664 had been paid in capital and interest from the gas undertaking; and the debt was reduced from £11,342 to £9527. This was clearly paid from profits. Yet there were some who told them that the gas-works were in a state of bankruptcy. Mr. Jarvis expressed his contempt for figures, and said the works were in a state of bankruptcy, when they owed now £1200 which they could not pay. The Chairman said they would always be in arrears unless they raised the price of gas so as to get a working capital. Mr. J. Cornelius thought they ought to call in an expert; but, as usual, nothing was done either in the direction of ascertaining the actual position of affairs or of devising a remedy.

LEGAL INTELLIGENCE.

The Southport Corporation and the Gas Supply of Birkdale.

Last Thursday was the day fixed for the adjourned hearing of the summonses taken out by the Birkdale Urban District Council against the Southport Corporation for having, as alleged, supplied to the Urban District of Birkdale, on three specified dates, gas which was not of the illuminating power and quality provided by the Southport Improvement Act, 1871. The previous proceedings were reported in the "JOURNAL" on the 5th ult. (p. 987). The Magistrate's Clerk stated that, in consequence of a rule *nisi* having been obtained by the Corporation, questioning the jurisdiction of the County Justices (*ante*, p. 1176), application had been made for the adjournment of the summonses until the 18th inst. The Magistrates consented.

Unlawful Use of Water.

At the Hastings Police Court, last Wednesday week, Mr. G. Sabin was summoned for two contraventions of the Water-Works Clauses Act. Mr. B. F. Meadow, who prosecuted for the Corporation, explained that the defendant was Manager of the Lift Company, which was supplied by the Corporation with water for specific purposes. Mr. Sabin had recently taken some land near the lift, and had had a greenhouse built; and, without the knowledge or consent of the Corporation, a pipe had been laid from the Lift Company's premises to the greenhouse, where the water was used for the plants. Mr. Atkinson, for the defence, said Mr. Sabin had acted in ignorance. The land belonged to the Lift Company; and Mr. Sabin, as the Managing Director, was under the impression that he could use the water for the greenhouse. Directly he found he was wrong, he had the service disconnected, and wrote a letter of apology to the Corporation, offering to pay for the water he had taken, and make any arrangement which might be considered necessary. He was fined £6 and costs.

Injuries Caused through a Badly-Fixed Stopcock.

At the Exeter County Court, on the 21st ult., his Honour Judge Edge gave judgment in a case, heard at a previous sitting of the Court, in which a sum of £50, by way of damages, was claimed by Mrs. Battishill from the Corporation of Exeter, for the alleged negligence of their servants in the fixing of the cover of a stopcock. The accident occurred in Alpha Terrace, Heavitree, a suburb of Exeter, on the 24th of December last, when the plaintiff, a laundress, tripped over the stopcock, which projected above the pavement, broke her arm, and sustained other injuries which incapacitated her from work. It was alleged that the stopcock had been fixed by one of the Corporation's workmen. For the defence, it was stated that the stopcock was not fixed by them, or, if it was, it was done at the request of the owner of the premises before which it was located; and, as everything from the main to the house was his property, the Corporation were not responsible. The road was not a public highway; and, in any case, the Corporation had no jurisdiction over it, as it was in the area of the Heavitree District Council. Mr. D. Cameron, the City Surveyor, said it was not the practice of the Corporation to fix stopcocks for consumers, nor had he ever given permission for such a thing to be done. He had searched the books of the Corporation, but could not find that any person had been charged for the fixing of stopcock covers at Alpha Terrace. The amount of projection in respect of this particular cover was less than an inch. Mr. F. Kneal, the Superintendent of the water-works, said he had examined the cover of the stopcock, which was not defective. Such projection as there was was due to the wearing away of the stones around it. Mr. Martin, a builder, gave evidence as to the custom by which builders fixed the covers of the stopcocks, and said that in his experience the Corporation never did this. His Honour said he had no doubt that the cover of the stopcock was improperly fixed, though the plaintiff's witnesses might have been mistaken in saying that one of the Corporation's workmen did it. If he did fix it, they would be liable for the negligence, as he was acting outside the scope of his authority. The verdict would accordingly be for the defendants. The Town Clerk (Mr. G. R. Shorto), who represented the Corporation, said he did not ask for costs.

Lancaster Corporation Water Supply.—According to the report of the Borough Accountant of Lancaster (Mr. Clough) the income of the Water Department of the Corporation for the year ending March 25 last was £14,527, as compared with £12,550 in the preceding twelve months; the expenditure being £9237, as against £8120. The income from the sale of water was £105 more than before. Commenting upon the affairs of the department, Mr. Clough says: "The net profits for the year are £3290 3s. 6d.; being £1139 5s. 6d. less than last year. This is accounted for by the increased expenditure for maintenance, and the decreased income from water supplied by meter. In accordance with the resolutions of May last the renewal fund has been closed, and the reserve fund made up to the statutory amount of £12,000. The expenditure upon the new 15-inch main, amounting to £6421 13s. 1d., has been transferred to capital account, and added to the cost of completing the Damas Gill reservoir, for which the Corporation have authority to borrow £15,000. The balance to expend on this account is £1190 1s. The amount expended on the Blea Tarn reservoir is £361 8s. 5d. Since closing the accounts, the Local Government Board have forwarded their sanction to the borrowing of £61,484 upon this scheme. The term asked by the Corporation for the repayment of the debt was fifty years; and we should probably have obtained this under an Act. The Board have granted this term for £5300 only, representing the purchase of lands and easements; but for the construction of the reservoir, &c. (£56,184), they have allowed only thirty years—thereby increasing the anticipated annual charge for redemption by £682."

MISCELLANEOUS NEWS.

INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

Directors' Annual Report.

The Directors of the above-named Company have issued their report for the year ending March 31 last, which will be presented to the shareholders at their ninth annual general meeting next Friday. They open it with the satisfactory statement that the balance-sheet shows that their anticipations as to a largely increased business have been fully realized. The sales of burners in the above-named period were 600,000, as compared with 300,000 in the year 1894-5; and the amount realized therefrom was £347,830. The gross profits on the trading were £161,718. The net profits amount to £135,852, as against £78,196 for the year 1894-95. To this must be added the amount brought forward; making in all £149,307. Out of this has to be deducted the commissions payable to the Manager and Chemist (£30,661); and the Directors have thought it advisable to write off the whole of the amount standing to English and new patent account—viz., £12,204. In addition to this, an amount of £3937 is to be reserved as representing 25 per cent. of the 6 per cent. debenture issue and bonus, in accordance with the terms of the issue. The balance available for dividend is therefore £98,566, out of which an interim dividend of 3s. 9d. on each ordinary, and £7 4s. 6d. on each preference share, amounting to £74,928, was paid on the 10th of April last; leaving a further sum of £23,638 available for final dividend. The Directors propose to pay a final dividend of 6s. 8d. on each preference, and 3d. on each ordinary share. This will absorb £3609, and leave a balance of £152 to the credit of the ordinary share dividend account, which will be carried forward to next year's dividend on these shares. The balance of £20,136 will be carried forward. The Directors state that the scheme for the exchange of the Company's ordinary and preference shares for those of the English Incandescent Gas Share Company, Limited, has been attended with very great success; and there are now outstanding only 1004 ordinary shares (of which the Directors hold 600 for qualification purposes), and 79 preference shares which have not been so exchanged. They also remark that the litigation in which the Company have been engaged with the Sunlight and De Mare Companies, has for the present come to a conclusion, and in a manner eminently satisfactory to the Company.

MONTE VIDEO GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Friday, at Winchester House, Old Broad Street, E.C.—Mr. A. K. MACKINNON in the chair.

The SECRETARY (Mr. A. G. Hounsham) read the notice convening the meeting; and the annual report and accounts—referred to last week—were taken as read.

The CHAIRMAN, in moving their adoption, said the Directors in the report had briefly informed the shareholders of the loss of their esteemed colleague Mr. W. O. Dodgson, who, since he joined the Board in 1888, had always been a zealous worker in the Company's interests. As to the announcement of a reduction in the metric price of gas at Monte Video from July 1 next, this would approximately equal 50c. per 1000 cubic feet, or 12½ per cent. At the meeting last year, he pointed out the effect of the reduction of 20 per cent. in 1887, which was made quite spontaneously, and without regard to the competition against them. While there was a prospect of arriving at a satisfactory arrangement in connection with the public lighting, the Directors felt that these sacrifices might be made with benefit to all concerned. But as this object had not been attained (all things considered it was as well in the interests of the Company, seeing that the public lighting had entailed a severe loss, as the shareholders of the past were well aware), the Board felt they had to rely upon the merits of their manufacture, and to push the consumption as much as possible. They had come to the conclusion that the time had now arrived to make a reduction. There was a probability—amounting almost to a certainty—that they would not only obtain an increased consumption by the present consumers, but would add to their number, and also extend the uses of gas. Supposing their anticipations as to an increased consumption were not realized (which would be taking a pessimistic view of the matter), the result of the reduction would be a loss in the next half year of about £3000 to £3500, to meet which they had an ample provision in the balance of £6631, which they carried forward in the present accounts, without touching the reserve fund. There were already encouraging signs of improvement in their business for the current year. The latest returns showed the small, but gratifying, increase of about 2 per cent. in the consumption for the first three months of this year, compared with the corresponding period of 1895. But in March, there was a decrease of 1·88 per cent., which was owing to the fact that in March, 1895, there were two nights' illuminations. If these had not taken place, there would have been, in March of this year, an increase of 5·17 per cent. Referring to the accounts, he said that on the debtor side of the balance-sheet, for the first time since 1889, there appeared 2904 unissued shares, equal to £58,080. In 1890, the shareholders sanctioned the raising of an equal amount in debentures for the purpose of undertaking the extension of the works. In the general bond, it was set forth that the holder had the option of conversion into shares between Oct. 1 and Dec. 31, 1895. As none of the debenture holders exercised that option, the 2904 shares remained to be issued, should it be deemed desirable hereafter in the interests of the Company, and the 2904 debentures would be drawn for repayment. Thus there would be £4600 of debentures to be drawn in November this year for payment at par on Jan. 1, 1897. The reserve fund still stood at £74,000; the insurance fund, at £12,500; and the contingency fund, at £27,279. The balance of profit and loss account was £1497 better than in 1894. As to the creditor side of the accounts, they had written off capital for depreciation the sum of £2319, or £468

beyond the amount charged last year; and they had added to capital for new and additional mains and services £1706, which was equivalent to a reduction in capital expenditure of £613 compared with 1894. The stock of materials, &c., was less by £4222. The investments amounted to £64,463, or an additional £5533. Regarding the revenue account, the balance carried to profit and loss account was £3089 less than in 1894; and in this he had no doubt they saw the continued result of the great saving which the consumers had effected through the introduction by the Company of improved and economical burners. In the profit and loss account, it would be seen that £4028 had been realized by the sale of securities. The proceeds of the sale and other money up to £54,889 had been re-invested; and the investment was worth that day £2902 more than it figured at in the balance-sheet. At the last meeting, some comments were made as to the reserve fund; and he might say that he felt their reserves should be limited to a certain sum. He thought the total should be one-fifth of the nominal capital of the Company, or £120,000; so that, with an additional amount—a little over £6000—they would reach that sum. The shareholders would now realize the wisdom of having resolved upon having a good substantial reserve fund, and so placing the Company on a firm basis. They were enabled on the present occasion to distribute a 2½ per cent. dividend for the half year ending December last, or 5 per cent. for the whole year, without trenching on the reserves. Before concluding, the Chairman said the Company were much indebted to the Manager (Mr. Lane), the Engineer (Mr. Anderson), and the Secretary for their able services, and for the zeal they had displayed in bringing about—considering the difficulties they had had to contend with—the satisfactory result for the past year. He also alluded to the appointment of Mr. M. T. Hood to the vacancy on the Board; remarking that his acquaintance with him at Monte Video and at Buenos Ayres extended over many years.

Mr. HOOD seconded the motion.

The CHAIRMAN, replying to a question, stated that for some years complaint had been made in Monte Video as to the price charged for gas. The people there forgot that they were away from England some 7000 miles; and that the Company had to pay very heavy freight and high wages for labour and prices for materials. The duties were also heavy upon the goods they had to import—even upon coal they had to pay duty. If these conditions could be eliminated, then they would be in almost a similar position to gas companies in England. The consumers ought to take these circumstances into account; but they did not. However, the Directors had done their best to deal with the difficult problem of satisfying the public. As to the further reduction they were about to make in the price, they were strongly recommended by their Manager to take this step. The Chairman also gave further information in regard to the reserves and other matters.

The motion was unanimously carried.

The dividend recommended having been declared,

The CHAIRMAN moved that the retiring Directors (Messrs. T. C. Tatham and Simpson Rostron) be re-elected.

Mr. ROBERT MORTON seconded the motion, which was agreed to.

The Auditors (Messrs. Price, Waterhouse, and Co. and Mr. E. Cheshire) were also re-appointed.

The Chairman and Directors and officers and staff were heartily thanked for their attention to the interests of the Company; and the proceedings terminated.

TORQUAY GAS COMPANY.

The Progress and Present Position of the Undertaking.

The fact that, in spite of the threatened opposition of the electric light, shares in the Torquay Gas Company have recently realized an unprecedented price, has moved one of the local papers to a glowing eulogium upon the undertaking. It is true the newspaper in question has not been very enthusiastic in support of the electric lighting scheme, and its praise ends with a hint that the Corporation, if it wants to experiment in lighting schemes, had better look to the gas undertaking rather than to the electric light. The shares sold were 300 in number, of the value of £10; bearing a dividend of 7 per cent. per annum. These were offered in lots of five and ten shares, and sold at from £17 5s. to £17 10s. each; the average being £17 8s. 10½d. per share. The highest price previously obtained was £16 10s. at a recent sale; while in June last the price realized was only £16 5s. The total amount received by the present sale was £5233 2s. 6d.—a premium of £2333 2s. 6d. In commenting upon the fact, the local paper points out that it has been given to few, if any, local undertakings to be so conspicuously successful as the Gas Company, whose prosperity, as well as the public confidence, is to be gauged by the high price obtained for the shares. Relating the history of the Company, it points out that the undertaking was established in 1834. For some time the Company's operations were confined within a very restricted area; but in the course of a few years the works were removed to a fresh site, from which both Torquay and St. Mary Church were supplied. In the fifties, the demand had overtaken the means of supply; and there were projects for two rival companies. Both of these failed; and the old Company purchased land and erected works at Hollacombe, from which Torquay and Cockington have since 1860 been supplied. Various extensions of the works have been made; and the latest, which is under the Company's Act of 1894, is calculated to meet the requirements of the district for many years to come. Some comparative figures show the progress of the undertaking. In the early years of the Company, the price of gas was 12s. 6d. per 1000 cubic feet; in 1879, it was 3s. 9d.; now it is 3s. In 1846 the staff consisted of a collector, a foreman, and a couple of stokers; now there are 92 workmen. In that year, there were 30 public lamps; in 1879, there were upwards of 500; and in 1895, there were 903, of which 799 were in Torquay and 104 in Cockington. In 1879, the Company's paid-up capital amounted to £56,937; now it exceeds £104,000. Then the income was £18,092; the expenditure, £12,390; and the profit, £5701. Last year the income amounted to £25,637; the expenditure, to £20,597; and the profit, to £5039—the diminished profit being partly, at all events, accounted for by a reduction of 9d. per 1000 feet in the charge for gas. In 1879, there were carbonized 9465 tons of coal; the make of gas being 81 million cubic feet, of which 68 millions were sold. Last year 14,833 tons of coal were carbonized; the quantity of gas made being 142 million feet, and the sales amounting to 126 millions. It is noteworthy that since 1879 the unaccounted-for gas has decreased from 17·84 to 8·96 per cent. of the make. The mains in Torquay and Cockington extend to 42 miles; and there are upwards of 2550 consumers. The Company have adopted automatic prepayment meters, and are supplying a ring burner and 6 feet of india-rubber tubing. The meters are arranged to supply 23 cubic feet of gas for each penny, or at the rate of 3s. 7d. per 1000 cubic feet—being 7d. more than the charge to ordinary consumers. Altogether, the Company are to be congratulated upon the success of the "forward" policy they have pursued of late.

THE GAS AND WATER ORDERS OF THE SESSION.

The Board of Trade have issued memoranda stating the nature of the proposals contained in the Provisional Orders included in the Gas and Water Provisional Orders Bills of the present session.

The Gas Provisional Orders Bill comprises Orders relating to Chester-le-Street and Pelton, Maidstone, and Settle. The first-named Order is to empower the Parish Lighting Company, Limited, to maintain and continue gas-works, and to manufacture and supply gas in the townships of Chester-le-Street and Pelton, in the county of Durham. The amount of capital is limited to £15,000 by shares (consisting of £10,000 original and £5000 additional share capital), and £3750 by loan; and the standard price to be charged for gas is fixed at 2s. 9d. per 1000 cubic feet, with a sliding-scale as to price and dividend. The Maidstone Gas Order is to give authority to the Maidstone Gas Company to issue debenture stock to the extent of one-third of the total amount received in respect of the share capital of the Company for the time being. The Settle Order is to empower the Settle Gas Company, Limited, to maintain and continue gas-works, and to manufacture and supply gas in the townships of Settle and Giggleswick, in the West Riding of the county of York. The amount of capital is limited to £8000 by shares (consisting of £5000 original and £3000 additional share capital), and £2000 by loan; and the maximum price to be charged for gas is fixed at 4s. 7d. per 1000 cubic feet, with power to the Board of Trade, after the expiration of three years, to alter it, or to substitute a standard, with sliding-scale as to price and dividend. Provision is made for the sale, under certain circumstances, of the undertaking to the Settle Rural District Council.

The Gas and Water Provisional Orders Bill comprises the Fort William Gas, Laindon Gas and Water, and Matlock Bath Gas Orders. The first-named Order is to authorize Mr. Hugh Mayberry, of Glasgow, to maintain and continue gas-works, and to manufacture and supply gas in the burgh of Fort William, in the County of Inverness; to supply gas in bulk by agreement beyond the limits; and to limit the capital of the undertaking to £10,000 share (consisting of £3000 original and £7000 additional capital), and £2500 loan capital. The maximum price to be charged for gas is fixed at 7s. per 1000 cubic feet, with power to the Board of Trade, after the expiration of three years, to alter the maximum, or to substitute a standard, with sliding-scale as to price and dividend. Provision is made for the sale of the undertaking to the Commissioners of the Burgh of Fort William within five years, if required by them; and they are to be empowered, within a certain period, to call upon the undertakers to provide a new site for the gas-works. The Laindon Gas and Water Order is to enable the Laindon Gas and Water Company, Limited, to construct and maintain gas and water works, to supply water, and to make and supply gas within the parishes of Laindon and Little Burstead, in the county of Essex, and to supply water in bulk by agreement within or beyond the limits of supply. The gas capital is fixed at £4000 by shares and £1000 by loan; and the water capital at £8000 by shares and £2000 by loan. The maximum price to be charged for gas is 5s. per 1000 cubic feet, with power to the Board of Trade, after the expiration of three years, to alter the maximum, or to substitute a standard, with the sliding-scale. The Matlock Bath Gas Order is to confer upon the Matlock Bath Gas Company the power to maintain and continue gas-works, and to manufacture and supply gas within the urban districts of Matlock, Matlock Bath, Scarthin Nick, Bonsall, and the rural districts of Cromford, all in the county of Derby, and to supply gas in bulk by agreement beyond the area. The amount of capital is limited to £20,000 by shares (consisting of £10,000 original and £10,000 additional capital) and £5000 by loan; and the maximum price to be charged for gas is to be 3s. 8d. per 1000 cubic feet, with power to the Board of Trade, after the expiration of two years, to alter it, or to substitute a standard, with sliding-scale as to price and dividend. In the event of the Matlock Bath and Scarthin Nick District Council obtaining powers during the present session to purchase the undertaking, the price to be paid for it is not to be increased by reason of the granting of the Order.

The Water Provisional Orders Bill comprises the Orders relating to Amersham, Beaconsfield, and the district, Burnham and the district, East Huntingdonshire, Hemel Hempstead, Maidstone, and Tilehurst, Pangbourne, and the district. The first-named Order is to empower the Amersham, Beaconsfield, and District Water-Works Company, Limited, to construct and maintain water-works, and to supply water in the parishes of Amersham, Coleshill, Beaconsfield, Chesham Bois, Chalfont St. Giles, Chenies, Seer Green, and Penn. It fixes the capital of the undertaking at £12,000 by shares; and borrowing powers to the extent of one-fourth of the share capital actually raised are conferred. The Burnham and District Order authorizes the Burnham, Dorney, and Hitcham Water-Works Company, Limited, to maintain and continue water-works, and to supply water in the parishes of Burnham, Hitcham, and Farnham Royal. The capital is fixed at £6000 by shares (consisting of £3000 original and £3000 additional capital), with borrowing powers equal to one-fourth of the share capital actually

raised. The East Huntingdonshire Order empowers the East Huntingdonshire Water Company to raise additional capital not exceeding £10,000 by preference shares, with borrowing powers equal to one-fourth of the additional share capital actually raised, but at the same time cancelling existing capital powers to a like amount. The Hemel Hempstead Order gives power to the Hemel Hempstead Water-Works and Laundry Company, Limited, to maintain and continue their water-works and construct additional water-works, and to supply water in the parish of Hemel Hempstead and part of the parishes of St. Michael's and Abbots Langley. The capital is fixed at £24,100 by shares (consisting of £12,100 original and £12,000 additional capital), with borrowing powers to the amount of one-fourth of the share capital actually raised. The Maidstone Order authorizes the Maidstone Water Company to raise additional capital not exceeding £12,000, by shares, with borrowing powers to the extent of £3000. The Tilehurst, Pangbourne, and District Order confers upon the Tilehurst, Pangbourne, and District Water Company, Limited, power to extend their limits of supply so as to include the parishes of Theale, Englefield, Tidmarsh, and Pangbourne, and to raise additional capital, not exceeding £3000, by shares, with borrowing powers equal to one-fourth of the share capital actually raised.

OLDHAM CORPORATION GAS UNDERTAKING.

The Working Results of the Past Financial Year.

The annual report of the Oldham Corporation Gas Department for the year ending March 25 last states that the expenditure on capital account in that period was: Gas-mains, £717; gas cooking stoves, £696—total, £1413. The gross revenue amounted to £126,269; and the expenditure, to £102,363—the balance to be carried to profit and loss account being £23,906, to which £4918, the balance from the previous year, has to be added. The annuities during the year amounted to £3540; interest on loans and stock, to £8278; and sums payable to the respective sinking funds, £4185. The amount to which the Corporation are entitled in aid of the borough fund is £9111. Altogether there is a credit balance of £3710. The quantity of gas supplied to street lamps and municipal buildings free of cost during the year was 60,202,000 cubic feet; and the benefit to the borough fund for gas thus supplied based on the selling price was £6063, which, with the £9111 paid over in aid of the borough fund, as stated above, gives £15,175 as the total amount by which the town has benefited. The fittings account shows a profit on the year's transactions of £402; making the disposable balance £409. The price of gas per 1000 cubic feet from March 25 to June 25 was: When the quarterly consumption is under 2 million cubic feet, 2s. 10d.; 2 million cubic feet and under 5 million cubic feet, 2s. 9d.; 5 million cubic feet and above, 2s. 7d. From June last year to March, 1896, the price was: Quarterly consumption under 2 million cubic feet, 2s. 9d.; 2 million cubic feet and under 5 million, 2s. 8d.; 5 million cubic feet and above, 2s. 6d. The discount allowed on the price if paid within the stipulated period was 6d. per 1000 cubic feet all round. The quantity of gas manufactured at the different gas stations was: Oldham, 197,270,000 cubic feet; Higginshaw, 434,846,000 cubic feet; Hollinwood, 380,711,000 cubic feet; Royton, 50,371 cubic feet—total, 1,063,225,000 cubic feet (against 1,022,688,000 cubic feet in the preceding year). The quantity of cannel and coal carbonized in its production was 103,762 tons. The average quantity of gas made per ton of cannel and coal carbonized was 10,274 cubic feet. The loss of gas from leakages, &c., during the year was 58,728,000 cubic feet, or 5·523 per cent. of the quantity made. The maximum amount of gas delivered in 24 hours was on Jan. 6 this year, 6,841,000 cubic feet; and the minimum, on June 23 last, 800,000 cubic feet. The average illuminating power of the gas supplied was equal to 19·1 candles. During the year, 729 new meters were fixed; the total number now in use being 46,768. The number of consumers is 45,778. The length of gas-mains laid in extensions, enlargements, and renewals is 6212 yards; and the mains taken up, 2455 yards.

LANCASTER CORPORATION GAS SUPPLY.

The Working in the Past Financial Year.

At the Meeting of the Lancaster Corporation on Wednesday, the 20th ult., the Gas Engineer (Mr. C. Armitage) presented his report on the working of the gas undertaking in the year ending March 31 last. It showed that the total receipts were £23,664; while the expenditure (including £891 for new mains) was £16,806—leaving a gross profit of £6858. After providing for the interest and sinking fund, there was left a net balance of £1099, which was added to the reserve fund, bringing it up to £11,926. There was no expenditure on capital account last year. The receipts for gas showed a falling off to the extent of £2118, of which £490 was due to decreased consumption and £1628 to reduction in the charge. The average price realized per 1000 cubic feet of gas sold was 2s. 3·55d., apportioned as follows: Net cost of gas, 1s. 4·65d.; interest on stock and mortgages, 6·45d.; sinking fund, 2·62d.; reserve fund, 1·83d. Mr. Armitage closed his report as follows: "The average cost of coal and cannel is 12s. 0·74d. per ton. Coke has contributed in return 4s. 3·46d.; and products from tar and ammoniacal liquor, 3s. 7·05d.—making a return for residual products of 7s. 10·51d., or 65·30 per cent. of the cost of coal. The prices of tar products have slightly improved since my last report, with the exception of pitch, which has remained about the same. Sulphate of ammonia has suffered a further loss of £2 per ton, and is now quoted at the low figure of £8 per ton. The consumption of gas during the last twelve months was 144,080,000 cubic feet—a decrease of 4,352,000 cubic feet, or 2·93 per cent. This decrease is due to a great extent to the very mild winter compared with the severe weather of the preceding year. The new bench of retorts on the generator principle is now being erected, after which the whole of the retorts will be worked on this principle. The works and mains have been kept in an efficient condition." The following is an extract from the report of the Borough Accountant (Mr. Clough) in reference to the Gas Department: "Compared with the accounts for the year ending March 25, 1895, the receipts from the sale of gas (amounting to £17,070 16s. 8d.) show a decrease of £2118 18s. 10d.; the receipts from residuals (amounting to £6167 1s. 2d.) also show a decrease of £1071 7s. 10d. The net profits for the year are £1099 5s. 6d., compared with £4550 1s. 4d. last year, and £930 7s. 2d. for the year ending March 25, 1894. The net profits for the past year have been transferred to the reserve fund account; making the total of the fund £11,926 10s. 5d., or within £73 5s. of the statutory amount. Full provision has this year been made for redemption of the debt within the period sanctioned by the Consent Order, 1894, and the Provisional Order, 1895; thus placing the gas undertaking upon a much sounder basis financially. It will doubtless be wise to augment these payments for debt redemption when possible; or to set aside annual sums for depreciation, which could be used in the future in repayment of the debt, or in any other way which the Corporation, from an extended experience, thought wise."

Mr. HELME, in moving the confirmation of the proceedings of the Committee, said the year's working showed a balance of £1099 to be brought forward to the credit of the reserve fund, which would now almost touch the maximum fixed by Act of Parliament. The result might, he thought, be considered satisfactory, when they remembered the exceptionally mild winter and the competition of electricity. The receipts only showed the small diminution of £490 as the result of decreased consumption; but owing to the reduction in price, they had lost £628. Then in respect of the sinking fund, while last year they paid £511, they had this year placed £1573 to the credit of that fund; so that they were now paying £1000 per annum more to the redemption of the capital debt than they did under the old system. It was a matter for satisfaction that they were dealing definitely with the extinction of the debt on a more liberal scale than hitherto. Residuals had produced a smaller sum this year than last—coke £601 less, and other products £471 less; and they had, on the other hand, spent on new mains £300 in excess of the sum spent last year. He was pleased to say that the works were in thoroughly good order.

Mr. ALLEN seconded the motion; and it was carried.

DUKINFIELD GAS SUPPLY.

Annual Report of Mr. Harrison Veevers.

The Engineer and Secretary of the Gas Department of the Dukinfield District Council (Mr. Harrison Veevers) has presented the accounts for the year ending March 31 last, together with his report thereon. The gas-rental amounted in that period to £8395, as compared with £8273 in the previous year; the receipts from the sale of tar, to £544, against £358; sulphate of ammonia produced only £227, instead of £531; but coke sold for £919, as compared with £886. The total receipts were £10,096, against £10,056. With regard to expenditure, coal and cannel cost £3577, as compared with £3669; wages, £1047, against £983; purifying material and labour, £87, against £154; retorts (material and labour), £235, against £150; repairs, £446, against £556; repairs of mains, services, and meters, £613, against £316. The total expenses were £7702, as compared with £7522 in 1894-5; the balances being £2394 and £2534. The former amount is insufficient by £805 to meet the annuities and the interest and sinking fund payments. Reporting upon the accounts, Mr. Veevers expresses regret that the balance is an adverse one, notwithstanding the fact that the cost of gas production has decreased since the last two annual balance-sheets were issued. He explains that the causes of this are mainly attributable to the depreciated income from the sale of sulphate of ammonia, amounting to £304; the increase in the cost of prepayment meters (£297) charged to revenue; and an augmentation of £309 in the sinking fund charge—from £466 to £775. With regard to this matter, Mr. Veevers says it is worthy of consideration whether it is equitable or advisable, in the interests of the consumers, and also of the Gas Committee, as having the responsibility of directing this department, that the whole burden of the sinking fund should fall on the users of gas alone, and not on the ratepayers, who are the owners. Each gas consumer is now, he says, paying 3d. for every 1000 feet of gas he consumes to a fund for purchasing the works for the future benefit of the ratepayers. The cash received from prepayment meters has been £355; and the number in use is 380, most of which have only been fixed for part of the year. The total quantity of gas made in the twelve months was 67,224,000 cubic feet, of which 60,997,000 cubic feet were sold and used on the works; leaving 6,227,000 cubic feet, or 9·26 per cent., unaccounted for. The following figures show the cost of gas per 1000 cubic feet sold in the past two years:—

	1896. s.	d.		1895. s.	d.
Coal	1	2·07	..	1	3·44
Manufacturing expenses	0	9·40	..	0	10·10
Distributing ,,	0	4·21	..	0	3·50
Management ,,	0	2·62	..	0	2·63
Gross cost of production	2	6·30	..	2	7·67
Receipts for residuals and sundries	0	6·70	..	0	7·51
Net cost exclusive of capital charges	1	11·60	..	2	0·16
Annuities, interest on loans, sinking fund, bank interest (less cottage rents)	1	0·58	..	1	0·22
Total cost of production	3	0·18	..	3	0·38
Average price of gas	2	9·03	..	2	10·83
Difference	0	3·15	..	0	1·55

Incandescent Gas Lighting for Alsager.—The Alsager District Council have decided to apply to the Local Government Board for power to raise £300 for street lighting purposes. It is proposed to put up 70 lamps, which are to be fitted with incandescent burners, and supplied with gas by the local Gas Company. The decision was come to upon a report made to the Council by Mr. F. Rigby, one of the members. The cost will be met by a rate of 3d. in the pound.

COVENTRY CORPORATION GAS DEPARTMENT.

Annual Report.

At to-day's meeting of the Coventry City Council, the Gas Committee will present their statement on the working of the year ending March 25 last. They report that, after providing £1404 for the sinking fund, there is a net surplus profit for the year of £4232, as against £5600 for 1894-5, and £3249 the year before. The increase in the consumption of gas was equal to 14·26 per cent. The decrease in the profits is accounted for by the fact that the price of gas was reduced 2d. per 1000 cubic feet this time last year, and by the depressed condition of the market for sulphate of ammonia. Last year the Council decided that £863 out of the profits should be paid into sinking fund No. 3, so as to complete it. This has been done; and the total amount of the fund—£1523—has been applied in repayment of loans to that amount. This sinking fund, therefore, disappears from the accounts after the present year. The charge for interest on loans has been further reduced in the course of the year by paying off mortgages to the amount of £19,650, and re-borrowing the money at a lower rate of interest. The liability on capital account is now £205,168, against which the Corporation have sinking and reserve funds amounting together to £22,803; leaving a net liability of £182,365. It appears to the Committee that this liability should be still further reduced. They accordingly recommend that a sum of £1000 out of the profits of the year be paid into the sinking fund, and that the balance, amounting to £3232, be handed over to the general district fund. The quantity of gas made during the year was 405,703,000 cubic feet, which was an increase of 50,628,000 feet compared with 1894-5. The number of consumers on March 31 was 6128; the addition during the year having been 144. The stoves on hire numbered 1576, which was an advance of 167.

ELECTRIC LIGHTING NOTES.

The Bournemouth Electric Lighting Company have a connection equivalent to 20,978 lamps of 8-candle power; and their business shows substantial increase during the year ending Dec. 31—largely resulting no doubt from a reduction in the maximum price of current from 8d. to 7d. per unit in April last year. But this is the state of the Company's finances for the twelve months: Their total income was £7431, and the expenditure £5273—giving £2158 as gross profit, as against £1642 in 1894. Owing, however, to increased capital outlay, there remains a debit balance of £237 to be carried forward.

The Electric Lighting Committee of the Portsmouth Corporation have received a report from Major Cardew relative to the recent accident in Middle Street, Southsea, when a cabman named Foote was injured by an electric shock from a lamp-column (see *ante*, p. 1179). Major Cardew reported that he had examined the column and switch, and found them in perfect order; the explosion being due to an escape of gas. There was no electric leak; but the gas had escaped from a pipe, which was found to be broken in two, and passed through the ducts to the column. When the arc light was turned out, and the incandescent lamps switched on, the gas exploded; and this was the cause of the accident. The injured man showed signs of having been struck by electricity—the muscles of the right arm being contracted. Major Cardew laid the point before Lord Kelvin; and the reply of this eminent expert was that flame was a conductor of electricity, and the current had been communicated to the man in this way.

The Chelmsford Town Council have resolved not to entertain the proposal of Messrs. Crompton and Co. to purchase their electric lighting works and undertaking for £34,828.

The Board of Trade will hold an inquiry in respect of the fatality at the electric lighting station of the Bedford Corporation on the 15th ult., as reported last week. In the meantime, a Coroner's jury have held an inquisition, and have found a verdict that Albert Edward Christmas succumbed to "electric shock." The evidence adduced was to the effect that the deceased was employed for about twelve months as a labourer at the station, and was accustomed to all sorts of work in connection with electric lighting so far as labour was concerned. On the day in question, Mr. C. English, the foreman of the outdoor staff, took Christmas and another workman to the sub-station at St. Mary's Square, Bedford. Deceased opened the covering, and they all went down to inspect the terminals in the transformers; but none of them wore india-rubber gloves, as the fuses were insulated with ebonite handles. Deceased and the other workman lifted the fuse-box off the transformer cover, as they were told to do. The box weighed about a quarter of a hundredweight, and as the men were handling it, they both gave a shout and fell down—one on either side of the station. One of the workmen quickly recovered; but Christmas died in three or four minutes. In the opinion of Mr. English, the deceased received a shock from a leakage; and if the india-rubber gloves had been worn, in accordance with the Board of Trade regulations, the accident would not have happened. The insulating cover of the high-tension wire must have been cut through, and in this way a connection made with the iron box, and a current established through the men's hands.

At a special meeting of the Hastings Town Council, held on the 22nd ult., the Public Lighting Committee presented a report on the subject of lighting the sea-front, in view of the expiration, on July 1, 1897, of the existing contract with the Hastings and St. Leonards Electric Light Company, Limited. As the Committee had reason for believing the Company would not be prepared to renew the contract for a further period, except at a much higher charge per lamp than is at present paid—viz., £25 per lamp per annum—they had under serious consideration the question of the desirability of the installation by the Corporation of an electric light system of their own, under the Provisional Order granted in 1890. They therefore gave instructions to the Borough Engineer to prepare plans and report on the matter; and he strongly advised the Corporation to undertake their own street lighting. He suggested that a site belonging to them near the railway should be utilized for the establishment of a generating station; and that plant in duplicate should be provided. He put the estimated cost of an installation on the alternate transformer system (that adopted by the Electric Light Company), complete in every respect for maintaining 70 arc lamps and duplicates, including the purchase of the Company's plant, at £7560; and the estimated annual cost of running 50 arc lamps, including interest at 3 per cent. and sinking fund, ample provision for maintenance, deterioration of machinery and lamps, &c., at £1639—equalling £32 15s. 7d. per lamp per annum. The Committee referred the whole matter to a Sub-Committee, who expressed the unanimous opinion that an installation on the lines indicated in the report should be established; but they recommended that, before proceeding further in the matter, the proposed scheme should be submitted to Mr. P. M. Grenville, who had been consulted by the Borough Engineer, with instructions to report fully thereon. The Committee adopted the recommendation; and a report was obtained from Mr. Grenville, in which he expressed the opinion that the scheme could be carried out and worked for the amount stated by the Borough Engineer. The Committee thereupon communicated with the Electric Light Company, with the view of ascertaining whether they would be prepared to name a sum for which, at the close of the existing contract with them for the lighting of the sea-front, they would be willing to dispose of the plant, &c., which, by the terms of the contract, the Corporation are bound to take at a valuation; and also whether they would be willing, at the expiration of the contract, to renew it on the same terms, or if not, on what other terms. Two of the Directors of the Company had an interview with the Committee. It was then ascertained that the Company would not renew the existing contract on the same terms, but would be prepared to supply energy for the lamps at 5d. per unit, to include cleaning, maintenance, and all charges; the quantity taken to be registered by meter at the Company's works, or, if preferred, at the lamps—two or three being grouped for the purpose. At this rate, it was calculated that the annual cost of each lamp of the present power, kept alight till 11.30 p.m., would be £35; and kept alight all night, £47—representing an average annual expense of £41 5s. per lamp, or £16 5s. per lamp per annum in excess of the present charge. The Committee gave details of the cost of lighting by gas and electricity the sea-front and other streets, localities, public buildings, &c., which they recommended should be lighted entirely by electricity under the proposed scheme; and they brought out a total of £1902 10s. Adding the proposed increased charge of £16 5s. per lamp per annum, or £845, they brought out a total future annual cost of £2747 10s. The estimated annual cost of lighting the whole of the above places by electricity they put at £2003. They arrived at this amount in the following way: Borough Engineer's estimated annual cost of proposed installation, including charge for interest on loan and sinking fund, £1639; lighting those portions of the Town Hall and the Brassey Institute now lighted by electricity at (say) 4d. per unit, as against 9d. per unit now charged by the Company, £53; lighting the gas-lamps and buildings, &c., now lighted by gas, £311. With regard to the last item, the Committee remarked that the present cost of gas lighting is £467 (the price per lamp, including, we may add, all charges besides gas), which, at 3s. per 1000 cubic feet, they took to be equivalent to electric light at 6d. per unit! But as it was anticipated that the Corporation would be able to furnish the light at 4d. per unit, they had deducted one-third of the £467. They thought they had shown that the proposed scheme would effect an annual estimated saving in the future cost of the lighting of £744 10s., equal to a rate of rather more than ½d. in the pound; and, having regard to all the circumstances, they recommend that an installation on the lines indicated should be established forthwith, and that application should be made to the Local Government Board for sanction to the borrowing of the estimated amount required. Mr. Idenden, the Chairman of the Committee, expressed his pleasure in moving the adoption of the report, as he considered the Council would be doing the right thing by agreeing to the proposal contained therein. The Deputy-Mayor (Alderman Tree) seconded the motion. He said the saving of more than £700 per annum was satisfactory to the ratepayers at large; and taking the contract from the Electric Light Company would be very satisfactory to them, because they had stated that they had lost to the extent of upwards of £800 every year on the public lighting of the town, and would certainly be very pleased to get rid of the Corporation. Dr. Allfrey, as one of the Sub-Committee, supported the recommendation; and the report was unanimously adopted. The statement as to the loss on the public lighting is verified by figures given in an electrical contemporary. In the year 1894, there were 86,850 units sold, at a loss of 2·03d. per unit; last year the sale was 115,000 units, at a loss of 1·84d. per unit.

As the Exeter Corporation propose to acquire the electric lighting undertaking of the present Company on the 30th prox., they are beginning to consider how they will stand in the matter of plant. It has been admitted all along that if the demand increases, as the Corporation hope it will, there must be a considerable extension of the generating power, and possibly a re-arrangement of the whole of the plant of the central station. This is especially necessary in view of the fact that the Corporation offer a continuous supply of the current, instead of the intermittent supply furnished by the Company. At a meeting of the City Council last Wednesday, the Electric Lighting Committee reported that it was necessary that the capacity of the works should be at once increased. In view of what appeared in the "JOURNAL" last week on the subject of gas for generating electricity, it is interesting to notice that the Committee stated that the increased power could be given either by steam or gas engines. The Surveyor, who is advising the Committee in the matter, said "a gas-engine would certainly be preferable for the purpose of giving an all-night supply; and it was possible that it might also be found to be better to have the extra power entirely from gas-engines, instead of fixing an additional boiler." There is wisdom in this, for the existing steam plant is now being worked up to its full capacity; and as the additional power will only be needed when the increased full load is on, auxiliary power will be most readily, and perhaps most cheaply, derived from gas-engines. Among the new plant required is an additional alternator, which, it is pointed out, can be driven either by a gas-engine or by steam. On the recommendation of the Committee, it was decided to invite tenders for both classes of machinery upon a guarantee of efficiency. The decision as between steam and gas is to depend upon the result of these inquiries as to price, and the Committee's opinion as to which is the more suitable.

AN ACCOUNTANT ON THE FORM OF GAS COMPANIES' ACCOUNTS.

In a paragraph published under this heading in the "JOURNAL" for April 3, brief mention was made of a lecture delivered before the Incorporated Accountants' Students' Society of London, by Mr. E. L. Burton, A.S.A.A. A full report of the lecture has since appeared in the "Journal" of the Society; and from it we extract the following:—

It is doubtless known to all or most of us that gas companies' accounts are of a special nature, and are made up in a particular form. This, however, applies more especially to statutory companies, and not necessarily to non-statutory ones. But it is with the former that I propose now to deal. And before proceeding with the subject of the accounts themselves, it will be as well, by way of preface, if I say something upon the nature of gas companies' undertakings, and how they may be and are brought into existence.

Gas-works are erected and gas is manufactured and supplied to the public in many places in this country by private persons as ordinary business undertakings. The necessary mains for affording a supply of gas are laid under the highways at the risk of the owners of the undertaking, and with very little security to them. The permission of the local authority to break open the roads, is necessary every time the mains and services are laid or otherwise dealt with. This may be given, or at any time refused without the owners possessing any remedy against the local authority. It will therefore be seen that a large sum of money may be expended under such circumstances with the by no means remote result of the undertaking being brought to a standstill. Again, any second person, or a properly-constituted company, might begin operations in the same district, and thus bring about a competition that may ruin the original party. In some cases, companies have been formed who have obtained statutory powers to supply gas in places already supplied by private persons, with the result that the latter have been deprived of their existence. Therefore it is that, in these days, when it is proposed to supply gas to the public, the company that may be formed for the purpose takes steps first to obtain parliamentary sanction, either by applying to the Board of Trade for a Provisional Order (which must be afterwards confirmed by Parliament) or by promoting a Special Act of Parliament. If successful, the company becomes a statutory or parliamentary company, with definite bounds set it within which to supply gas—with powers to open the public highways, &c., for the purpose of laying the necessary mains and service-pipes and repairing or renewing the same; with a standard price per 1000 cubic feet to be charged for the gas; maximum dividends which it may pay; and with many other onerous conditions as to the illuminating power of the gas, the pressure to be maintained, &c. In return for these it has the all-important and valuable privilege of virtually possessing the sole right to supply gas in its defined district. Hence a gas company, like water, railway, and other similar undertakings, is known as a "monopoly," and as being a "vested interest."

In 1847 the Gas-Works Clauses Act was passed; and in 1871 the Gas-Works Clauses Amendment Act was added to gas legislation. These two Acts, the most important of the various Gas Acts, have been incorporated, either wholly or in part, with all, or certainly nearly all, Acts and Provisional Orders granted to gas companies since their respective dates; and, with other smaller Acts, they contain the provisions before referred to governing this great industry. Schedule B of the 1871 Act consists of the form of accounts which gas companies working under the provisions of the Act are required to adopt. The forms of these accounts constitute an admirable and very skilfully drawn statement, enabling the whole of the affairs of the undertaking to be seen almost at a glance.

I propose to make some remarks upon the various divisions and items contained in the form, and will do so in the order in which they occur:—

(A)—STATEMENT OF SHARE CAPITAL shows very fully how, and to what extent, and under what conditions as to dividends that may be paid, the company is empowered to raise its share capital, setting forth the Act authorizing the share capital; the maximum dividends authorized; number of shares; amount of share called up; capital paid up; issued, but not paid up; remaining to be issued; and the total amount authorized.

(B)—STATEMENT OF LOAN CAPITAL states: Description of loan (mortgage or debenture stock); rate of interest; total amount borrowed; remaining to be borrowed; and total amount authorized. It can therefore at once be seen what powers are possessed by the company for the purpose of raising share and loan capital, and to what extent these powers have been, and remain to be exercised.

These facts are, of course, all very important; but inasmuch as both of these statements are more of the character of annotations upon "(C) Capital Account," and not integral parts of the accounts proper, they will not necessarily come before an auditor in going through the books of a company. Nevertheless, it is incumbent upon him, since they will appear over his certificate and signature, to see that the figures and facts given (with respect to the capital raised) are in accordance with those set forth in Statement C (which latter will come before him in his examination of the books), and are otherwise in order. To go further than this, the auditor must peruse the Act or Provisional Order, or perhaps a whole volume of these, which I venture to think for this purpose, and under these circumstances, is not necessary. His attitude towards extracts G and H appearing later in the accounts, and termed respectively, "Statement of Coals during the Year" and "Statement of Residuals during the Year," will be much the same, inasmuch as they contain figures which relate to the working of the undertaking, but are not part of the trading accounts proper. But these statements I will refer to again.

(C)—CAPITAL ACCOUNT FOR THE YEAR, the next in order, should contain the various classes of capital raised and the whole of the capital expended, as appearing in the books of the company. The debits are divided under five heads, which, given shortly, are: (*a*) Lands acquired; (*b*) new buildings, plant, &c.; (*c*) new mains, services, &c.; (*d*) new meters, &c.; and (*e*) cost of Special Act; to which must be added others where necessary, as, for instance, "new gas-stoves, &c." The total expenditure previous and up to the year under review is the first item in the account; the expenditure for the current year classified as just stated being given separately, and added in total to the previous expenditure—giving the total expenditure to the date of the accounts. This total will, or should, represent the actual cost of the land, works, plant, mains, and Acts of Parliament belonging to the company, which will be its chief asset. It will invariably be an ever-growing amount; and from an accountant's point of view, in many cases, it can only be justified as a good asset—*i.e.*, of the value stated—because of the capability of the company in each particular case to earn remunerative dividends upon the capital employed. No provision is made in the various Acts to enable a valuation of the whole undertaking to be made, in order to keep this asset down to the valuation by writing off depreciation. On the other hand, the amount spent out of revenue for the maintenance and up-keep of all the fixed and other plant, will invariably form, under certain heads of the revenue expenditure, a heavy charge upon each year's profits. It is also right that, in the event of any necessary abandonment of works and plant, a due allowance for same should be made in charging to capital future extensions or additions; so that the capital account should not be inflated by the original cost of a palpably non-existent asset. Where, however, works are built, or plant is erected, upon leasehold land, the schedule permits a depreciation fund to meet the case to be formed, as will be seen in dealing with the next account. Turning to the other side of the capital account, we find the share and loan capital appear fully stated in their respective classes (of which there may be several); the three columns displaying very clearly the amount of each class of capital raised previous to, and during the year that may be under review, and the total of each, and of the whole, to the close of the accounts. In balancing this account, we shall see how much unexpended capital is in hand, or, *per contra*, that the expenditure exceeds the amount received, which is sometimes the case, though this can only be a temporary state of things. Whether it be a credit or debit balance, it is carried to the balance-sheet either as a liability or an asset, as the case may be. The total liability on account of capital received, and the principal asset in the shape of the cost of land, works, &c., are not included in the balance-sheet, so that capital account is really an adjunct to, and part of, the former. This is, I think, not free from objection; and a deviation from the set form of accounts might, in this particular, be made with advantage. The balance in hand, or the over-expenditure, can be plainly seen by a reference to Statement C; so that I see no reason why the total capital received and total capital expended should not take their proper places in the balance-sheet.

(D)—REVENUE ACCOUNT FOR THE YEAR is prolix in the number of its items, so much so, that little else could be given with any advantage. The credits are divided broadly into—sale of gas, residuals, and sundries. The first will be the main source of the company's revenue, the gross figures for the year being here given, both in the quantity of gas sold (in cubic feet) and in the charge made for same, together with the rental charged for meters let on hire. Allowances for overcharges are first deducted both from the quantity of the gas and the amount of the charge. Residual products (coke, breeze, tar, and ammoniacal liquor) are—taken together—the second source of a company's income. These are stated "less labour and cartage," and are therefore the net profits arising from the respective residual. The sundries are—rent, transfer fees, and, where stoves are let on hire or sold, "stove-rents" or "profit on sale of stoves," together with any other source of income that it may be found necessary to state. *Per contra*, the expenditure is divided and sub-divided thus:—

(*a*) *To Manufacture of Gas, comprising:*—

1. Coals, including dues, carriage, unloading, &c.
2. Purifying materials, including oil, water, &c.
3. Salaries of engineers.
4. Wages, &c., at works—*i.e.*, the wages of men employed within the works proper in carbonizing the coal, purifying the gas, enginemen, &c., and not including wages of men engaged in repairs to works or to mains, or employed in the landing and weighing of coal and loading and weighing of coke, pumping tar, &c., which are charged under their respective proper heads.
5. Repair of works and plant, which means, generally speaking, cost of repairs within the works and not on the district (which latter is mostly charged to repair of mains, &c.). Off this item is taken any amount received for old material sold.

(*b*) *To Distribution of Gas.*

This is the cost of distributing the gas from the gasholders, where it is stored, through the mains throughout the district to the consumers, and is sub-divided again into—

6. Salaries of surveyor, inspectors, and clerks in light office.
7. Repair, maintenance, and renewal of mains and service-pipes, including materials, laying, paving, and labour.
8. Repairing, renewing, and refixing meters, and, in the case of companies hiring-out gas-stoves, a similar item for repairing, renewing, &c., gas-stoves.

(*c*) *To Public Lamps.*

9. Lighting and repairing. Here is charged the cost of lighting, cleaning, and repairing the public or street lamps. It will be seen, on referring to the other side of revenue account, that the revenue derived from the public lamps is also stated separately.

(*d*) *To Rents, Rates, and Taxes.*

10. Rents.
11. Rates and Taxes.

(*e*) *To Management.*

12. Directors' allowances.
13. Salaries of secretary, accountant, clerks, &c.
14. Collectors' commission or salaries.
15. Stationery and printing.
16. General establishment charges.
17. Auditors.

(f) To Law and Parliamentary Charges.

18. Law.
19. Parliamentary (oppositions), by which is meant expenses incurred by the company in opposing legislation which it is deemed may be detrimental to its interests.

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20. To depreciation fund for works on leasehold lands.
21. To bad debts,

Making up the total expenditure, the balance of the revenue being carried to profit and loss account.

It must be admitted that the expenditure is really exhaustively classified in the foregoing account, and that it would be difficult to further amplify the various heads. They are very clearly stated, and in most cases speak for themselves.

Item No. 20 is a very important one where buildings or plant are situated on leasehold land. Due care should be taken in such a case, if and when the profits permit, that a sufficient sum is charged and set aside from time to time equal eventually to the loss that will be sustained upon the expiration of the lease.

Items 5, 7, and 8 will mainly be the cost of maintenance, renewal, or up-keep of the works and plant generally. Except in the case of newly-built works and newly-laid mains, they will usually form heavy items. As a rule, or at least in many cases where they are very light, it will be the result either of charging too much against capital and too little against the revenue, or of what is sometimes termed "starving the works"—*i.e.*, not keeping the works, &c., in proper repair.

(E)—Profit and Loss Account (Net Revenue), calls for no particular comment. On the credit side we find—

1. By balance brought from last account;
2. Amount drawn from reserve fund (if any), less dividends paid for the half-year;
3. Balance brought from Revenue Account D, being profit for the year;
4. Interest on moneys deposited;

and *per contra*—

1. To amount carried to reserve fund (Account F) from profits;
2. To interest on temporary loans, &c.;
3. „ „ „ mortgages on bonds;
4. „ „ „ debenture stock;
5. „ half-year's dividends on first preference;
6. „ „ „ second preference;
7. „ „ „ ordinary shares;

and—

To balance of net profit to be carried to next account, subject to half-year's dividend.

(F)—Reserve Fund Account is, on the credit side—

1. By balance brought from last account;
2. „ „ „ „ profit and loss account (E);
3. „ interest on amount invested;

while the debits are—

1. Amount (if any) carried to profit and loss account to make up deficiencies of dividend to 31st December, 18—;
2. Amount paid for extraordinary claim or demand;
3. Amount of balance to be carried to next account.

This account is merely a subsidiary statement of this particular fund—an amplification of the items of reserve fund in the balance-sheet and profit and loss account. It should, of course, be looked to that the figures are correctly stated. But a still more important matter may be here dealt with, that will be of concern to the auditor. Sections 31 to 35 of the Gas-Works Clauses Act, 1847, lay down that a company working under the provisions of the Act, shall, when its profits exceed the amount necessary to pay the statutory dividend, together with former deficiencies, set aside such excess of profits and invest them, together with all interest from same, to form a reserve fund until the fund shall equal one-tenth of the nominal capital of the company. This fund may be used to make up any deficiency in the divisible profits of the company, or to meet any extraordinary claim—in the latter event two justices being required to certify as to the claim being an extraordinary claim within the meaning of the Act. When the reserve fund is full—that is, equal to one-tenth of the nominal capital—the interest arising from the investments is to be carried to the general purposes of the company. Where the profits are more than is required to pay the authorized dividends, and where the reserve fund is full, the surplus profit is to be used in reducing the price of gas; and where such reduction is not made, the Court of Quarter Sessions (on the petition of two consumers) can enforce such reduction if it thinks fit after examination, &c., of the accounts of the company by some accountant or other qualified person appointed by the Court. On the other hand, where the profits are not sufficient to pay the authorized dividend, the fund may be used to supply the deficiency. It therefore becomes the duty of an auditor to make himself familiar with the legislation governing the company whose accounts he is auditing, that he may satisfy himself that the reserve fund is properly dealt with, as he will assuredly be held to be a responsible party to any misuse that has been made of the fund contained in the accounts he has audited, unless he takes due care to protect himself.

It will be noticed from the accounts of many companies, that an insurance fund forms also a part of the reserves. This is intended to meet any extraordinary claim, demand, or charge that may arise. As this is a fund which is authorized usually by the various Private Acts of companies, it will in each case be governed by the special circumstances and conditions set out in the Special Acts. The auditor must here again make himself acquainted with all the matters affecting this fund if it appears in the accounts which he has to audit.

The intention of the Legislature in permitting companies to form these funds has been to give them a position of security; but the limits set them are so many safeguards against the interests of the consumers being prejudiced by the action of a company in keeping up the price of gas in order to build up reserves of undue magnitude. The provisions of the 1847 and 1871 Acts relating to these and other matters are frequently over-ridden by a company's Special Act.

(G)—Statement of Coals during the Year, and (H)—Statement of Residual Products during the Year, are, as I have before remarked, not of vital concern to the auditor. But a glance at them will give him some idea of the working of the company; and if he is at all acquainted with the nature of these undertakings, they will possibly enable him to detect anything contained in them of an unusual character, in which event he might probably feel it to be his duty to call attention thereto. The stocks on hand at the close of the year, as given in these statements, will, of course, come before the auditor in a stock-book, or in the form of a stock-sheet, duly authenticated. I need not point out that these should receive his careful attention. The quantities and the prices at which they are taken should satisfy him to the same extent as he would require assurance in other trading concerns and in the usual discharge of his duties. Residuals should be taken at well within the ascertained average selling prices.

(I)—General Balance-Sheet calls for very little comment as regards its form further than the remarks I have already made on the omission of the capital received and expended. The schedule items provide for all the likely liabilities and assets of a company with two or three exceptions.

It will doubtless be seen that the obligatory use of this form of accounts by companies, subject to the 1847 and 1871 Acts, is productive of great advantages to directors, auditors, shareholders, and other interested persons. Its use enables a very close comparison to be made between one company and another. To an auditor, especially, the gain is a considerable one, as his duties in each successive audit, or on going from one company's accounts to another's, will more or less take a regular form, and proceed on lines which, to an extent, can be almost definitely ascertained and laid down.

In opening the books of an average gas company, the cash-book should be drawn up in analysis form, consisting on the debit side of columns for, say, gas-rental, residuals, services, and deposits, in addition to the total or bank column. Upon the credit side, we should find it advisable to have a column for wages, and another for bought account or general expenditure, in addition to the total or bank column. Other columns may be added where found necessary; and a blank column on each side is useful.

The details of receipts on account of gas-rental, residuals, &c., should be kept in a separate cash-book, and the totals only entered at proper intervals in the chief cash-book. By adopting this system, the posting into the ledger is reduced to a minimum, as the columned totals will be posted from time to time—say, monthly or quarterly. It will readily be seen that from the great number of heads included under the capital and revenue accounts, the expenditure both for purchase and for wages will undergo a lot of analysis. For this purpose the general expenditure should be passed through an "Analysis Journal," and the wages through a somewhat similar one. The headings should follow the order of the expenditure items in the schedule accounts, with others that may be found necessary added. In opening the chief ledger, the same order should be observed, as it will be found of no little advantage. Separate ledgers should be opened for personal accounts for goods purchased—*i.e.*, a bought ledger and also one for residual customers.

Dr. CASH.

Date.	Cash.	Chief Ledger Folio.	Gas-Rental.	Residuals.	Deposits.	Sundries.	Bank.

CASH. *Cr.*

Date.	Chief Ledger Folio.	Cash.	Bought Ledger Folio.	—	Bought Account.	Wages.	Bank.

Perhaps I should say a few words particularly referring to the audit of these accounts. In companies of any considerable size, the gas-rental ledger or record of consumers' accounts forms an important and considerable item of the figures which will come before the auditor. One of the best and simplest forms is that adopted by, I think, most of the leading companies. The summary made in this book each quarter when adjusted for overcharges or for any allowances made to consumers will give the precise quarter's revenue from sale of gas, rent of meters, &c.; and this should be passed into the chief ledger by a journal entry debiting "gas-rental" (*i.e.*, sundry debtors for gas) and crediting revenue account direct. The auditor must be his own guide as to the extent he may think it necessary, or find it possible, to examine the volume of figures which the gas-rental will

present. His responsibility will, of course, be ever before him, in this, as in other matters. In nearly all companies the rule is to read the meter indices—*i.e.*, record the quantity of gas used by each consumer, at the end of every quarter—usually on March 31, June 30, Sept. 30, and Dec. 31, or closely thereabouts. It will be seen, therefore, that where the books are made up to the 31st of December, the current quarter's consumption will always be due (except for temporary supplies, &c., the cash for which will probably have been received) plus the arrears—*i.e.*, all sums due for gas consumed during previous quarters. These together are the item No. 7, appearing as one of the assets in the balance-sheet; but this may be less in amount than the gas-rental book will show, as where deposits are taken from consumers by the company as security against default in payment—a practice found necessary, and adopted, by many of the large companies—the gross amount of such deposits in hand is not stated separately as a liability, but taken off the amount due for gas, as will be seen by the wording of the item. These deposits should be kept quite distinct in the books from gas-rental, to avoid any complication. It is frequently necessary to cancel the deposit, as such, and transfer the amount to the credit of gas-rental as payment for gas in those cases where payment could not otherwise be obtained.

The question of arrears is one that the auditor should specially notice. Where they are unduly large, he should not hesitate to make a report upon the matter, as if two or three quarters' payments are in arrear, the debt may be a very doubtful one, seeing that a certain class of consumers come and go, and that, when once gone, it becomes a matter of more or less difficulty to trace them, and perhaps more difficult still to recover the sum due. The amount due for residuals should also be carefully scrutinized for similar reasons. Special powers are given under the 1847 Act for the recovery of amounts due for gas, enabling summary proceedings to be taken before the justices. Gas companies are, therefore, to a great extent, in a position different to many other commercial undertakings where large credit is an admitted necessity, which is a factor the auditor should bear in mind.

Another most important consideration is the allocation of expenditure between capital and revenue. This is, it is true, more a question for the engineering expert than the auditor; but the latter should make such inquiry as he thinks necessary, and should take all reasonable means of satisfying himself as to the *bona fides* of the charge in each case. Again, the general results of the year's working should be closely scanned; the quantity of gas produced per ton of coal carbonized; the quantity of coke produced per ton of coal carbonized; the quantity of gas sold and the quantity unaccounted for (which is an important factor in working); the quantity of coke used in furnaces and the quantity sold of the total produced; the selling value of residuals; the relation of wages, repairs of works, repairs of mains, &c., to the general result—all these are matters which can furnish assurance to an auditor's mind or otherwise. There will be found no golden rule to help him in the direction indicated, no rigid or fixed lines for him to go upon; but it should not be difficult for him, upon inquiries in other directions, to obtain an average of results that would serve as a basis of comparison. This phase of an audit is necessarily nebulous; and while the auditor should guard against any usurpation of the province of the practical gas expert, or the directors of the company (since to deal with the various results of the working is essentially the office of the latter), he should not lose sight of the important relation that these results have to the proper conduct of the company's business on the part of its responsible officers—at least so far as that conduct is affected by their integrity and straightforward dealing.

Suggested Purchase of the Westhoughton Gas-Works.—Notice of motion had been given for consideration at the meeting of the General Purposes Committee of the Westhoughton District Council yesterday, expressing the opinion that it would be of advantage to the township if the Gas Company's works were taken over by the Council, if the undertaking could be secured at a fair and equitable price. An abortive endeavour was made some years ago, in the days of the old Local Board, for effecting a similar change.

Reductions in Price.—The Gas Committee of the Darwen Corporation have recommended the Town Council to reduce the price of gas by 3d. per 1000 cubic feet to small consumers. The Gas Committee of the Heywood Town Council recommend that the price be reduced as follows: For ordinary consumption, from 3s. 8d. gross and 3s. 2d. net to 3s. 6d. gross and 3s. net; for stoves and motive power, from 3s. 2d. gross and 2s. 9d. net to 3s. gross and 2s. 6d. net. The reduction in price by the Colney Hatch Gas Company, mentioned in the "JOURNAL" last week, is 2d. per 1000 cubic feet (from 4s. to 3s. 10d.); and it will come into force on the 1st of July next.

Exhibitions of Gas Appliances.—On Monday, the 25th ult., Mr. Corbett opened an exhibition of gas cooking and heating appliances which the Gas Committee of the Carlisle Corporation had arranged in the New Public Hall in that city. He was accompanied to the platform by Mr. C. B. Newton, the Gas Engineer of the Corporation. Mr. Corbett said this was the fifth exhibition the Committee had organized, and he hoped it would be as successful as the previous four. Round the room they had ranged the very best makes of stoves, heaters, and gas-furnaces; the object being to afford the citizens an opportunity of seeing all the latest improvements effected by the best makers of gas cookers and stoves during the course of the year. Miss Alice Leng subsequently gave a lecture, with demonstrations, on high-class cookery. On the following day, a gas exhibition was opened under the auspices of the Epsom and Ewell Gas Company, at the Public Hall, Epsom. Each afternoon and evening during the exhibition, Miss Ada Wardrop gave lectures on the use of the appliances exhibited, which she illustrated by cookery demonstrations. An exhibition of gas appliances was held in Leith from Tuesday to Friday of last week, by Messrs. John Wright and Co., Limited, at which Miss Beatrice Shaw lectured twice daily; one in Hamilton, by the London Fire Appliance Company, at which Mrs. Young, of Glasgow, was the lecturer; and one in Forfar, by Messrs. Fletcher, Russell, and Co., Limited, at which Miss Dodds was the lecturer.

GAS AND METER TESTING IN MASSACHUSETTS.

In the "JOURNAL" for March 31 last, we noticed the annual report of the Board of Gas and Electric Light Commissioners of Massachusetts, and referred incidentally to the quality of the gas supplied by the various companies under the supervision of the Board. Some additional particulars in regard to this matter are furnished by the report for the past year of the official Inspector of Gas and Meters (Mr. C. D. Jenkins), a copy of which document has been forwarded to us by him.

Taking meters first, we find that during the twelve months ending Dec. 31 last, 28,408 were inspected. Of this number, 27,451 were either new or repaired meters, presented for inspection by the manufacturers or gas companies, as required by law. A number of them, being found to register incorrectly, were returned for adjustment and then tested again. Section 12, cap. 61, of the Public Statutes, provides that a consumer or gas company may request the official inspection of a meter in use. If the meter is correct, the party requesting the inspection pays the expense of removing the meter and having it tested; while, if the meter prove to be incorrect, the gas company must pay all charges, and furnish a new meter to the consumer. Of this class, 959 meters were tested last year, with the following results: 549, or 57·36 per cent., were correct within the legal limits of 2 per cent. fast or slow, and were re-sealed; 301 were fast, the average error being 4·73 per cent.; 93 were slow (against the gas company)—average error, 9·72 per cent.; 1 meter would not pass gas, while 13 would pass gas but would not register. The average error of the 943 registering meters was 0·4 of 1 per cent. fast. The greatest error in the fast meters was 22 per cent. Two were 15 per cent., 16 between 10 and 15 per cent., and 97 between 5 and 10 per cent. fast. Of the slow meters, 1 registered 237½ per cent. against the gas company; one, 112 per cent.; three, between 50 and 65 per cent.; three, between 20 and 35 per cent.; five, between 15 and 20 per cent.; seven, between 10 and 15 per cent.; and 47, between 5 and 10 per cent.

Private meter inspectors have again appeared in the State, testing consumers meters in place by remeasuring the gas through a small dry meter—a method not conducive to accurate results. It would seem that the consumers go to needless expense in having meters tested in this manner, when they have the right to an official inspection at a very much less cost, if any, than for the private test. This matter has been referred to before in the reports of the Gas and Meter Inspectors. With the increasing number of meters used, there necessarily comes a demand for meter-provers; and last year five were standardized. This is a delicate operation, and requires atmospheric conditions comparatively hard to obtain.

The inspection of the gas supplied by the 69 companies proceeded much as usual; 544 inspections having been made by the Inspector and his assistant (Mr. L. S. James). Two inspections yearly are made of each company, and an additional one for every 6 million cubic feet of gas supplied, until the tests become weekly. A test comprises the determination of the candle-power, the quantity of sulphur and ammonia, and the presence of sulphuretted hydrogen. The higher-power water gases are tested for candle-power by Sugg's table-top open burner, 6 feet size; the mixed gases and coal gas by Sugg's "London" argand improved form, size F. This form increases the illuminating power from one-half to three-quarters of a candle; but, as it fulfils the requirements of the law, it has been adopted as the standard argand for testing purposes.

Leaving out the oil-gas companies, the average for the State were: Illuminating power, 19·30 candles, a decrease of 0·01 candle; sulphur, 9·29 grains, a decrease of 0·18 grain; and ammonia, 2·46 grains, a decrease of 0·11 grain. The 38 coal gases averaged 18·03 candles, an increase of 0.05 candle; the 11 water gases averaged 23·28 candles, a decrease of 0·36 candle; and the 10 mixed coal and water gases averaged 19 65 candles, an increase of 0·02 candle.

Several companies failed to comply with the law in respect to the purity of their gas. With regard to ammonia, the Inspector remarks that as ammonia has a market value worth considering, and as it is not difficult to remove a large proportion of it, the companies generally keep below the legal limit of 10 grains per 100 feet of gas; but when the apparatus is small compared with the output, so that the gas is washed quickly, the ammonia frequently reaches the neighbourhood of 10 grains. As to sulphuretted hydrogen, very little excuse can, he says, be offered for its presence but accident or carelessness. A trouble not usually looked for, especially in the smaller works, is the fouling of the water in gasholder tanks by the absorption of ammonia and sulphuretted hydrogen. Though this matter has been noted on various occasions in former reports, yet in the past year one company incurred a fine for sending out gas fouled with sulphuretted hydrogen from the tank water, while the gas was being properly purified and put into the holder clean.

The companies making gas from petroleum or its products do not, as a rule, purify their gas with lime or iron—simple washing being sufficient. But last year, by using a different or more impure petroleum, some of them made a gas requiring more thorough purification in order to get rid of sulphuretted hydrogen—a process for which they were not prepared.

From the increasing use of gas for fuel purposes, it has been thought desirable to make some tests of the calorific power of various kinds of gas. But, owing to the difficulty of obtaining the necessary apparatus and of getting it into shape to carry about, only a start has been made. The apparatus used was a Junkers calorimeter; and the method consisted in determining the increase in temperature of a definite volume of water and the quantity of gas used in doing the work. From these results, the heat-units per cubic foot of gas are easily calculated. Boston gas was found to have a calorific value of 681·8 British units; and South Boston gas, of 24·7 candle power and ·656 specific gravity, was found to have a calorific value of 634·8 units. When a test was made at Cambridge, the gas was somewhat poorer than the average at that place, and so the results showed what a poor coal gas would do. The candle power being 17, and the specific gravity ·497, the calorific value was found to be 576 units.

GRAND JUNCTION WATER-WORKS COMPANY.

The Half-Yearly Report and Accounts.

The accounts of this Company for the six months ending March 31 last, which will be presented to the proprietors at the half-yearly meeting on the 10th inst., contains entries amounting to £5248 as special expenditure. A portion of this charge (£3337) is for lowering the mains in the country districts, with the view of lessening, as far as possible, the risk of the recurrence of the serious loss and inconvenience caused by the intense frost of the early part of 1895. In their report, the Directors say that the shareholders must be prepared for a similar entry during the next two half years. The rest of the special expenditure (£1911) represents the Company's share of the cost incurred in opposing the rejected Transfer Bills of the London County Council. With reference to the Bill brought in by the Government, the Directors trust it will ensure a more equitable regard for the interests of the shareholders in the London Water Companies than was manifested by the Bills of the County Council. The accounts show that the water-rental in the half year covered by the report amounted to £102,175, as compared with £100,288 in the corresponding period of 1894–5; the total revenue being £102,949, against £101,168. The expenditure on maintenance was £33,610; the special expenditure, as mentioned above, was £5248; a sum of £8302 was spent for management; £50,289 is carried to the dividend and interest account; and there is a balance of £5500 to provide for losses. The corresponding items for the six months ending March 31, 1895, were as follows: Maintenance, £31,613; special expenditure, £8216; management, including parliamentary expenses, £8652; dividend and interest, £46,187; balance, £6500. The amount applicable to dividend is £44,842, as compared with £42,357 in the six months ending March 31, 1895; and the Directors recommend a dividend at the rate of 7½ per cent. per annum on the ordinary and the "C" (£25) shares, and of 7 per cent. per annum on the £50 "D" shares.

THE MIDDLESEX COUNTY COUNCIL AND THE GOVERNMENT WATER BILL.

At the Meeting of the Middlesex County Council last Thursday, the Parliamentary Committee presented a report on the Metropolitan Counties Water Board Bill. It set forth that, at the meeting of the Council on the 23rd of April, the following resolutions of the Committee in reference to the Bill were adopted:—"That it is desirable that any Bill dealing with the water supply of the Metropolis should be confined to the control of the water supply to the Metropolis, and should not sanction purchase." "That it is not desirable that the outside authorities should be represented on any Water Board constituted for the Metropolis, but that they should be left to deal with their own supply, without any right of interference for the purposes of the Metropolis." "That under no circumstances should the outside authorities be called upon to contribute to the cost of the Metropolis Water Supply, nor should any part of their area be included in any scheme affecting the water supply of the Metropolis." "That if the Bill be proceeded with on its present lines, the Committee take such action as they think best in order to give effect, so far as may be, to the views of the Parliamentary Committee of the Council, as expressed in their report of July 20, 1891, upon the water question, and to the foregoing resolutions, and generally to protect the county interests." The report went on to state that at a conference, convened by Surrey, of representatives of the Metropolitan Counties, on the 27th of April last, it was resolved—"That it be respectfully intimated to Her Majesty's Government that, in the opinion of this conference, the interests of the County of London, and of each and all of the surrounding county authorities within what is called in the Bill the Metropolitan Water Area, are so diverse as to make the constitution of a Water Board as proposed impracticable, without injustice to the several areas included therein." A deputation from the Committee had an interview with Lord James of Hereford, and placed before him the views of Middlesex, as embodied in the resolutions of the Council given above. His Lordship stated that he was not prepared to limit the Bill to control; that they could not deal in a Public Bill with the question of the apportionment of water between different counties; and that as the Water Companies whose areas were partly in Middlesex and partly in London drew supplies from the Thames, this formed a ligature which bound Middlesex and London together. He intimated that he would probably be prepared to insert clauses in the Bill to empower Metropolitan Counties (*a*) to promote Bills so that they might take steps with a view to get separate life; and (*b*) to appear and oppose any Bill to be promoted by the Water Trust. The deputation gathered from Lord James that he was in favour of outside authorities having autonomous life, if that condition of things were possible. The Committee thought it most desirable, in the interests of the county, that the Bill should be referred to a Select Committee, in order that the case of the Metropolitan Counties generally might be put before the Committee, with a view to prove the desirability of its amending the provisions of the Bill so as to meet the resolutions of the Council. Lord James was accordingly asked to refer the Bill to a Select Committee. But he declined to do so; and the Committee considered the decision he came to in this respect was to be much regretted. Having given details of the amendments made in the Bill in Committee of the Whole House, the Committee went on to say they had had under consideration a letter from the Surrey County Council, to the effect that they regarded those amendments as satisfactory, and had decided that the Bill should not be opposed; but they recommended: (1) "That the County Council adhere to the resolutions adopted at the meeting on the 23rd of April." (2) "That the Bill itself should (*a*) exclude Middlesex from all liability to contribute to the expenses of the Water Board, and to the cost of any scheme for the supply of water to the Metropolis; and (*b*) provide that in any Bill to be promoted by the Board for the acquisition or control of any of the Metropolitan Water Companies, not only shall any such Bill secure to the inhabitants of the county the rights of water supply which they now enjoy, but further, as regards any rivers, streams, springs, or wells in the county from which any Water Company derives its supplies, shall empower any sanitary authority in the county to require such daily supply of water in bulk as any such authority may demand, to the extent of 35 gallons per day per head of the population within the district of any such authority, at a rate or charge to be agreed upon, or, failing agreement, to be settled by arbitration under the Arbitration Act, 1889." (3) "That a copy of any resolutions adopted by the County Council embodying the above recommendations of Committee be forwarded to Lord James, with a request that they may receive his favourable consideration." The report was adopted.

STAFFORDSHIRE POTTERIES WATER-WORKS COMPANY.

The Annual General Meeting of this Company was held at Hanley last Wednesday—Mr. J. F. WILEMAN presiding.

In their report, the Directors stated that the revenue for the year (subject to voids and irrecoverables) was £38,371, against £36,471 for the corresponding period of 1895—showing an increase of £1900. The available balance on the year's profit and loss account was £17,138, which, with the addition of £564, brought forward from the last account, made a total of £17,702. After deducting the interim dividend, a balance of £9002 remained, out of which the Directors recommended a dividend at the rate of 6 per cent. per annum for the half year ended March, 1896 (free of income-tax); making, with the interim payment, 6 per cent. for the year, and leaving a balance of £302 to be carried to the next account. In the course of the year, a break-pressure tank was built at Penkhull, and a covered service reservoir at Bagnall. The general extensions of the district had involved the laying of about 22 miles of mains, and further extensions were in hand.

The CHAIRMAN, in moving the adoption of the report, referred to the large increase of revenue which had taken place during the year. Only a few years had elapsed since they opened their magnificent pumping-station at Hatton, when they thought they had met the demands of the district for the next twenty years; but they would very soon have to consider where the next supply was to come from. The amount charged for the repair of mains was abnormal; but it would be remembered that the great frost of last year only terminated in the middle of March, and their financial year ended on March 31. They found after the frost a general "smash up"—mains being broken, and damage done to a very large extent. There was, indeed, an enormous waste of water—at one time as much as a million gallons a day. In order to overcome this great waste, they had to employ inspectors to make a house-to-house visitation to discover where leakage existed. Happily, they had overcome the difficulty; and everything was now well in hand. He considered the dividend of 6 per cent. had been amply earned.

Mr. G. STOKES seconded the motion, and it was carried unanimously.

The dividend recommended having been declared,

The retiring Directors were re-elected; and Mr. J. S. Goddard was appointed Auditor, in place of Mr. T. Bickley, who had been promoted to a seat on the Board.

An extraordinary meeting was subsequently held, at which a resolution was passed sanctioning the raising of £10,000 of consolidated ordinary stock, as authorized by the Company's Act of 1888.

SHEFFIELD CORPORATION WATER SUPPLY.

The Working of the Water Department in the Past Financial Year.

The Manager of the Sheffield Corporation Water-Works (Mr. W. Terry, F.S.S.), has presented to the Water Committee his report for the year ending the 25th of March last, accompanied by a detailed statement of accounts for this period. The expenditure on capital account to the corresponding date last year amounted to £2,205,436; and this was brought up to £2,221,441 during the past financial year by the outlay of £16,005. The total income derived from water-rates for domestic and trade purposes during the year amounted to £104,299, against £100,779 in the previous year; showing an increase of £1526 from water supplied for domestic use, and £1994 from that sold for trade purposes by meter—a total increase of £3520. The receipts from meter and other rents and plumbing work (less *per contra* items) were £5248. The total income from all sources was therefore £109,547; being an increase of £3635, or 3·43 per cent., over that of the previous year. The expenses of maintenance and management (less *per contra* items) amounted to £20,868. Adding the cost of temporary supplies and repairs of mains, &c., damaged by frost, £9464, the total was £30,332; showing an increase of £8565 as compared with the year 1894-5. The net revenue was £79,215, on which were the following charges: Annuities, £56,566; interest on corporation stock, &c., £20,275—together, £76,841; being an increase of £738 on the previous year, and leaving a net profit of £2374, as against £8041 in the preceding year. The eighth annual instalment set aside out of revenue for the redemption of annuities and the extinction of the loan indebtedness amounted to £6171; leaving a deficiency for the year of £3797. Deducting the net surplus on March 25, 1895, £49, there was left a deficiency on March 25, 1896, after discharging all liabilities, including the sinking fund, of £3748. The total amount provided from the revenue account for the sinking and loans fund to March 25, 1896, is £53,214.

With regard to the works and plant, Mr. Terry says the effects of the frost of 1895 upon the distributing-pipes and other apparatus were only partially disclosed prior to the 25th of March last year. The accounts at that date, therefore, included only the expenses then ascertained—viz., £1156. The larger portion of the costs have been incurred since in repairing fractured mains, &c.; and they are dealt with in the accounts. The work of repairing, relaying, and lowering pipes following on the frost was not completed until the second week in July. The mains thus repaired or relaid extended to an aggregate

length of 31,519 lineal yards, or 17⅞ miles. The number of applications made direct to the Water Department by consumers whose pipes were frozen or burst, or who were otherwise deprived of water, was upwards of 16,000; in addition to which 10,925 applications were received from plumbers requiring the water to be shut off for repairs, where stop-taps were not fixed. Notwithstanding that their resources were chiefly devoted to restoring the permanent supply of water to the consumers at the earliest possible moment, the department repaired upwards of 7200 lead communication-pipes belonging to owners or occupiers of property. This, with the much larger number repaired by the town plumbers, will give some idea of the effect of this frost of unprecedented intensity and duration; and it furnishes a ready explanation of the fact that the draught upon the system reached a maximum of 16 million gallons per day, as compared with the normal daily consumption of about 7½ million gallons. The suppression of this serious waste naturally involved a considerable increase in the staff of inspectors; and it was not until the second week in August that the normal consumption was restored. The total expenditure incurred last year in affording temporary supplies to consumers, and for incidental works to improve the service, amounted to £9464, as compared with £1156 in the year 1894-5.

The number of houses supplied with water at the close of the financial year was 76,058; being an increase of 1487. The number of closets served was 7151; and the number of baths, 4210. There were 2993 water-meters in use, as compared with 2892. The grand total of all supplies on March 25 last was 99,006, as compared with 95,896 in the preceding year.

CHEMICAL V. BACTERIOLOGICAL EXAMINATION OF POTABLE WATER.

A recent number of the "Journal of the American Chemical Society" contained the following article by Mr. W. P. Mason on the above subject:—

In reference to recent articles upon this question which have appeared in the English papers, it is noteworthy that there is a growing tendency among physicians and civil engineers to belittle the chemist's opinion regarding the potability of a water, and to pin their faith exclusively upon what the bacteriologist may have to say upon the subject. This feeling is strengthened by the publication of the results of such trials as that undertaken by the London Local Government Board, in which water samples purposely inoculated with typhoid germs were sent for analysis to one of England's leading chemists, and were by him pronounced pure.

Those who set special value upon such a test of methods as the above, and who consider it quite final as showing the inability of chemistry to detect pollution in a liquid which the bacteriologist would instantly pronounce very foul, should remember that such a sample of water could not be found in practice; and that the very conditions under which it was prepared eliminated the chemical items indicating pollution, while it increased tremendously the signs governing the bacteriological side of the case.

The bacteriologist sought for the Eberth bacillus, and, very naturally, quickly found it in a water purposely sown with a culture of the germ. The chemist looked for those elements which always occur in sewage-laden water, whether the sewage be from sources of disease or otherwise; and, not finding them, he pronounced the water to be what it really was, free from sewage addition.

Sewage, as it occurs in practice, contains an immense deal of material other than that productive of disease; and it is upon just this comparatively harmless, but constantly present, material that the chemist relies for the indication upon which he bases his opinions. He is unable to say whether or not a sewage-laden water is disease-bearing on any particular date; for to him all sewage is alike. But he condemns the water, for the reason that, although it may be perfectly harmless to-day, it is absolutely impossible to predict what may be its condition to-morrow

I have lately been requested to make a bacteriological examination of the water of a certain well, in order to determine if it be affected by neighbouring cesspools. The physician who made the request was impressed with the belief in the paramount value of such an examination and the comparative uselessness of chemical analysis.

I am quite convinced that, had I followed his suggestion, I should have sought in vain for any specific microbe; but inasmuch as upon chemical analysis I found that the chlorine ran 24 parts per million, which is about ten times the local normal, and the nitric nitrogen read 9 parts per million in place of 0·116, I condemned the water off-hand without going further.

There is simply no comparison between the two methods in question for water problems of this class; and the value of chemistry is still more pronounced in those instances where it is possible to introduce common salt or lithium chloride into a source of suspected pollution, and then look for increased chlorine or presence of lithium in the water of the well. In legal cases touching upon this point of contamination of wells, by cemeteries for instance, the chemical testimony is especially strong.

In the matter of determining the suitability of a stream for a city supply, the services of the bacteriologist should be unquestionably secured. But it is doubtful if his report can be considered of more importance than that of the chemist. Chemical analysis, by comparing the water taken at the site of the proposed intake with that from the same stream above all points of possible pollution, can indicate whether or not up-stream contamination is felt at the lower point. Nor is it necessary that the polluting sewage be from pathogenic sources in order that its presence may be recognized. As Dr. Dupré has pointed out, chemistry in such cases anticipates what may happen in the future, and, by timely advice, may prevent an outbreak of disease; while, on the other hand, the discovery of disease germs in a water is only possible after the water has become infected. Bacteriology is of especial value, and greatly superior to chemistry, for the testing of filters and watching any variation in their efficiency. For this purpose, the simple counting of germs per cubic centimetre is most valuable, and differentiation is a secondary matter; for the assumption is a just one, that a filter which will remove the harmless bacteria will take out the objectionable ones as well.

It is very far from my desire to decry the value of bacteriology; but I cannot but feel that, in their enthusiasm over the great triumphs of the new science, the people at large have gone slightly bacteria mad, and are apt to expect more than can be furnished by the means and information now available.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The effect upon gas consumption of the exceedingly bright and genial weather which has been experienced this season, is now becoming apparent. The Engineers to the Edinburgh and Leith Gas Commission this week have reported a decreased output during April to the extent of 2,179,000 cubic feet, as compared with the same period of last year. The Commissioners have now finally adjusted their coal contracts for the current year. The average price is, in the Edinburgh works, 10s. 3d. per ton, as compared with 12s. 5d. last year; and in the Leith works, 10s. 8¾d. per ton, as compared with 11s. 3d. last year. First-class cannels have gone down in price from 21s. to 18s. 3d. per ton; but the other varieties of coal have not fallen so much. Only a few years ago first-class cannel was selling at 35s. per ton. Then the expectation was that, as it was getting scarce, the price was bound to rise. That it has gone the other way is due to the introduction of enrichers—chiefly by means of oil. It is probably a forerunner of the introduction of carburetted water gas into the Edinburgh works, that the quantity of first-class cannel contracted for is only 1000 tons, as compared with 4000 tons last year. In the Leith works, where no oil process is as yet contemplated, I observe that the quantity of first-class cannel contracted for has been increased from 3000 to 4000 tons. I should say that, over the whole year, from May 16 to the end of April, there has been an increase in the output of gas to the extent of 63,753,000 cubic feet over the quantity in the same period of last year. This shows an exceedingly healthy business.

The accounts of the Gas and Electricity Departments of the Dundee Corporation, for the year ending April 30, have been made up. They show, in the gas department, that the estimate of revenue drawn up a year ago was £81,179; while the actual receipts amounted to £81,923—being an excess of revenue over the estimate of £743. The estimate of expenditure, including a balance from the previous year of £131, was £80,784; while actual payments amounted to £82,106—being an excess over estimate of £1322, and over actual income of £183. The principal details of the revenue are: Gas accounts, £73,935; meter-rents, £3007; chemical products, £4529; coke, £210; and gas-stove rental, £83. The expenditure included the following items: Balance from previous year, £131; coal, £38,744; purifying, £816; main-pipe repairs, £789; service-pipe repairs, £617; repairs of buildings, £1295; gas apparatus, tools, &c., £4716; retorts and setting, £1580; meter repairs, £1720; fuel, £363; interest account, £6075; expense of loans, £100; annuities, £7243; assessments, £4805; salaries, £2951; coal analyses, £418; sinking fund, £7500; and contingent fund, £500. The sums paid into the sinking fund now amount to £141,172, and are applied as follows: In payment to the Dundee New Gas Company, beyond what the Commissioners were bound to pay, on getting a corresponding deduction from the annuities, £6269; annuities redeemed, £1422 (the actual cost being £39,660); mortgages redeemed, £33,650; loans redeemed, £10,000; cash in bank, £51,592. The capital account shows the amount expended at last balance to have been £206,755; and last year, £1445—total, £208,201. The gas delivered during the year was 512,376,300 cubic feet; and the total quantity sold, 464,216,750 feet—realizing £77,478. Discount and bad debts amounted to £3543. There was 42,676,550 cubic feet of gas unaccounted for, or 8·329 per cent. In the electricity department, the revenue was estimated at £4400, and it reached to £5004; while the expenditure, which had been estimated at £4386, amounted to £3877—showing a surplus of £1127. This is the first surplus which has been realized. A year ago, there were accumulated debit balances amounting to £2181, which were wiped out by appropriating gas profits. The capital expended on the undertaking amounts to £35,473.

As compared with the results reported a year ago in the gas department, there is an increase of £1951 upon the gross revenue, £1933 upon the gross expenditure, £2739 upon the revenue from gas and meter rents, 16,809,800 cubic feet in the output of gas, and 16,305,250 cubic feet in the quantity of gas sold. There was, however, a decrease of £704 in the amount derived from chemical products, and of £8 from coke. Unaccounted-for gas is slightly less, having been reported last year at 8·505 per cent.; but two years ago it was reported as having amounted to 8·143 per cent. As compared with two years ago, the output of gas shows an increase of more than 32 million cubic feet. With the exception of the returns from residual products, the results are in every way satisfactory. The quantities pertaining to the electricity department have not been given yet.

Having reached the end of their financial year, the Committee have begun to apply their minds to the affairs of the current twelve months. It is estimated that, with gas at the same price as at present—3s. 4d. per 1000 cubic feet in the city—there would be a surplus of about £5000. The question has been raised whether that surplus should be disposed of in reducing the price of gas by 1d. per 1000 cubic feet, and abolishing meter-rents in both the gas and electricity departments, or whether meter-rents should be retained and the price of gas reduced by 3d. per 1000 feet. The Committee considered the subject yesterday; and the resolution come to, by very close majorities, was to abolish gas-meter rents, but in the case of electricity to charge such rents for meters as would recoup the interest and sinking fund on their original cost—the price of current to remain the same as at present. The question has still to come before the Corporation for decision. It

depends chiefly on the different interests between large and small consumers. The large consumer favours reduction, and the small consumer the abolition of meter-rents; and the question for the Corporation is which class they wish to encourage.

The details have not yet come to hand, but it is reported that the revenue of the Perth Gas Commission for the year ending April 30 amounted to £20,783, and the expenditure to £15,753—leaving a surplus of £5030. These figures show a decrease in revenue of £27; in expenditure, of £53; and in surplus, of £36. The estimate for the past year was to meet an expenditure of £20,020. Considering that last year the price of gas was reduced 3d. per 1000 cubic feet, the results obtained are eminently and entirely satisfactory. Mr. A. Wilson, the new Manager, is to be congratulated upon his first annual report.

The Falkirk Gas Commission have £900 on hand, which says a good deal for their management. To buy their own stock, does not appear to be much advantage to them, as they would have to pay £103 10s. for it; and so they have resolved to seek another investment. In the meantime, they are content to wait to see whether their own stock will not fall—rather a paradoxical situation to be in.

The Forfar Gas Corporation on Monday agreed to contracts for about 3500 tons of coal for the current year. Even this, however, could not be accomplished without objection on the part of Mr. Christie, who moved that another class of coal should be got for one of the sorts. His reasons were that the Manager was departing from custom in leaving out the coal he favoured; and that they were making a rope to hang themselves with in selecting a poor quality of coal. Of course, he knows little or nothing about the matter; but to worry the Manager seems to be one of his delights.

The Aberdeen Corporation Gas Committee have, after revising the wages-lists, areed to recommend an increase of 1s. per week to nearly all the workmen employed by them, and of 2s. a week to two foremen.

Lord Pearson, in the Bill Chamber of the Court of Session, had before him on Wednesday an application by John Magee, of Glasgow, to have Tangyes Limited, of Birmingham and Glasgow, interdicted from infringing a patent relating to gas motor engines, which he obtained in 1892.* The complainer asserts that the respondents have been manufacturing and selling gas-engines embodying a material part of his invention. In reply, the respondents say that the complainer is not the first and true inventor of the arrangement, as it was not new at the date of the patent; and, further, that the invention does not constitute proper subject matter for a patent. Lord Pearson sent the case into the Court of Session for trial, but refused in the meantime to grant interim interdict.

Mr. Mackenzie, the Convener of the Edinburgh Electric Lighting Committee, submitted a report with regard to the working of the undertaking under his charge for the period from April 11, 1895, when the installation was inaugurated, till May 15 of this year. He said that commencing with a small load, and having not only a full staff to keep up, but heavy standing charges to meet, they were for nearly six months working at a loss; the turning point being about Sept. 26. From that point to April 16, they made their income for the year. They were now again working at a loss; so that, making their report for thirteen months was a disadvantage, they having made a loss from April 11 to May 15 of about £200. The total income for the thirteen months from private lighting was £13,220, after allowing the discounts; and for this they sold about 550,000 units. The receipts from public lighting were £3604; and the units sold, 320,000. The total number of units sold was thus 870,000; and the income amounted to £16,824. The total station expenses had been about £4700, including carbons, trimming arc lamps, and upkeep of mains. The standing charges, interest, and contribution to sinking fund amounted to about £8100, making a total charge of about £12,800, and leaving a balance of about £4024. The Engineers estimated their income to May 15, 1897, at £28,100 calculated at present rates; and the total expenditure, at £21,122—leaving a balance of £6978. The Electric Lighting Committee thought it would not only be fair to consumers, but the best policy for the Corporation, to reduce the charge for lighting from 6d. to 5d. per unit, and for motors to 3d.; to abolish meter-rents; and to reduce the charge for public lighting from £20 to £18 per lamp. This will reduce the estimated income by about £4100, but will still leave an expected balance of £2878. The proposals of the Committee were adopted, and Mr. Mackenzie was complimented upon his good management of the undertaking. I have not seen the official accounts, and meantime I say nothing as to the figures; but on the general result of his labours in connection with electricity, I do not wish to be behind anyone in congratulating Mr. Mackenzie. The Corporation of Edinburgh have not another member who could have done the work so well.

In the Glasgow Corporation, the Joint Committees who have for some time had the subject of how to improve the electric lighting in the city under their consideration this week asked that the subject be left with them till they are able to see what will be the effect of some experiments they are making. They have made up their minds that the overhanging lamp which is in use in Brighton would be the best to employ in Glasgow; but further than this they are not prepared to go. Why do not they call in Professor Kennedy again? It was under his advice that the installation was constructed; and his later venture in Edinburgh has proved a success which, it might be expected, they would be glad to follow. Perhaps they do not accept all that is given out with regard to the Edinburgh installation.

At the same meeting of the Glasgow Corporation, on the motion of Mr. Osborne, the Father of the Council, it was resolved to impose water-rates for the current twelve months at the same amounts as last year—viz., 6d. per pound domestic rate within the compulsory area; 10d. per pound beyond the compulsory area; and 1d. per pound public rate. It was stated that the hydraulic power service had realized £4000; but there was a deficit upon it of £2190. The demand for power had not quite come up to expectation. There were only six users last year; but they were doing everything they could to encourage the citizens to take advantage of the works, and they hoped for an improvement in the demand.

* See "JOURNAL," Vol. LXI., p. 1157.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 30.

Sulphate of Ammonia.—The firmer tone of the market noticed in the last report has continued throughout the week. There has been less general buying; but important orders have been booked, and, supplies not being very abundant, makers have been able to maintain the prices last reported. The quotations remain at £8 to £8 2s. 6d. per ton f.o.b. at the ports. Consumers, no doubt impressed by the low range of values current, would be willing to buy at a small premium on spot prices for delivery July/September. But makers for the most part decline to offer in this position, unless at a substantial advance; and their prices for delivery up to March next are still more prohibitive. Speculators seem rather shy of the July/September position at the premium obtainable; being uncertain as to the policy which may be pursued by the large makers who hold stocks, and being unwilling to depend on small current production in the country for "covering" sales. In the later position, however—the period of large production—they seem more inclined to tempt fortune; and sales are reported at £8 12s. 6d., delivery early 1897, f.o.b. east coast.

Nitrate of Soda is quiet at 7s. 10½d. per cwt. for ordinary, and 8s. for fine quality.

LONDON, *May* 30.

Tar Products.—The demand for benzols still continues good; and the higher prices are maintained. Buyers appear to be looking with some anxiety to the future; and inquiries have been made for delivery over the first half of next year. There seems every probability of still higher prices being obtained. Creosote is also better. There is a complete absence of stocks; and the demand is good. Pitch has also shown improvement during the week, and will probably touch a higher figure within the next few weeks. Prices are as follows: Tar, 18s. to 24s. Pitch, 30s. to 32s. 6d. Benzol, 90's, 2s. 4d.; 50's, 2s. 1d. Toluol, 1s. 8d. Solvent naphtha, 1s. 3½d. Crude, 30 per cent., naphtha, 9d. Creosote, 1½d. Naphthalene salts, pressed, 50s.; drained, 32s. 6d. Cresylic acid, 1s. Carbolic acid, 60's, 2s. Anthracene, nominal, "A," 11d.; "B," 8½d. to 9d.

Sulphate of Ammonia has slightly receded from the recent advance, and is now quoted at about £8, less 3½ per cent. discount; while gas liquor is offered at 6s. to 7s. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—In the coal trade of this district there is practically little or nothing to report this week. Collieries have been closed in the Manchester neighbourhood for seven or eight days for the Whitsuntide Holidays; and in other districts stoppages have extended over three or four days. Notwithstanding this, all descriptions of round coal continue plentiful, with prices weak; and even at concessions upon list rates, sales are difficult. Best Wigan Arley coal can be bought at 9s. 6d. to 10s. per ton at the pit mouth; Pemberton four-feet and seconds Arley, 8s. to 8s. 6d.; and common round coals, from 5s. and 5s. 6d. for steam and forge qualities, to 6s. 6d. and 7s. for house-fire descriptions. For slack there has been a good deal of pressure to get in supplies for engine purposes, where mills have been working during the week. This has somewhat hardened prices temporarily; but no general advance is obtainable. From 3s. to 3s. 6d. per ton is still the average rate for good ordinary slack; and 4s. 6d. to 5s. for the best qualities. Shipping prices remain without improvement; 6s. 9d. to 7s. per ton being still taken for steam coal delivered at Lancashire ports, and 7s. free of toll delivered at the Partington tips of the Manchester Ship Canal.

Northern Coal Trade.—There has been a rather fuller demand for steam coal of late; and the collieries have thus been able to work normal time. But the range of prices is no better; and in one or two instances a slightly lower rate has been taken to enable the pits to obtain trade at a time when it was needed to give full work. Best Northumbrian steam coal may be quoted now at from 8s. to 8s. 3d. per ton f.o.b.; and steam smalls, at about 3s. 9d. The low price is inducing the fitters of collieries to make efforts to lessen the cost of shipping the coal; and two or three endeavours in this direction are being made—to reduce, for instance, the dues on the Tyne. As yet, however, there has been no definite and large result. In manufacturing coals, the demand is a little better; but the price is unaltered. Gas coals are in low request for local use; but for export, one or two collieries have a very good sale at present. Generally, the current prices vary from 6s. 3d. to 6s. 9d. per ton f.o.b.; and there is likely, in a few weeks, to be an increase in the deliveries under contracts. This will, however, only give a little fuller work to some of the collieries that are very poorly occupied just at present. There is a good demand for smithy coal for export. Coking coal has at the present time the best appearance in the fuel industries, for the production of blast-furnace coke is now at its highest point; the consumption in Durham, on Teesside, and in the north-western district being very large, and showing no sign of diminution. The price is on the basis of 13s. 9d. per ton, free at the Teesside furnaces. The shipments of both foundry and gas coke are limited at present—the latter especially; but it is anticipated that there will be an attempt to foster a larger export trade. For shipment, best foundry coke is quoted at 15s. per ton f.o.b. Gas coke seems on the whole to be weaker in price, in consequence of the lower exports.

Scotch Coal Trade.—It cannot yet be said that any change has taken place in the coal trade in Scotland, except it be that there is a growing indisposition on the part of coalowners to contract forward. For contracts of more than three months' duration, an advance of 3d. is being asked. Otherwise coal of all sorts is plentiful, and there is a large and increasing trade doing. The prices remain the same—viz., Main, 5s. 9d. (easy) per ton f.o.b. Glasgow; ell, 6s. 3d. to 6s. 9d.; splint, 6s. 3d. to 6s. 6d.; and steam, 7s. 6d. The shipments for the week amounted to 167,647 tons—an increase upon the preceding week of 13,914 tons, and upon the corresponding week of last year of 21,359 tons. For the year to date, the total shipments have amounted to 2,716,906 tons—an increase upon the quantity in the same period of last year of 202,047 tons.

Downpatrick without a Water Supply.—Owing to a dispute with the contractor for the water-works, Downpatrick has lately been without a supply of water; and the Board of Guardians have appointed a Committee to arrange with a private landowner for the temporary supply of the town from a lake on his property.

Welsh Water for Wales.—The Water Committee of the Glamorgan County Council last Thursday resolved to recommend the Council to draft a Bill creating the counties of Glamorgan, Monmouth, Brecon, and Carmarthen into a gigantic Water Trust. The object is to preserve the water supplies of the eastern portion of South Wales, which the London County Council have been taking steps to secure, and to ask the Local Government Board to assist in introducing a Bill into Parliament for this purpose on the same lines as the Ministerial scheme for London. The matter came before the Committee on the report of the Engineers for the construction of reservoirs and works for the storage of water for the use of the counties and boroughs interested (see *ante*, p. 1180). To carry the project out in its entirety would involve an expenditure of £10,000,000 sterling; the extent of the proposed gathering-grounds being about 122 square miles. It is suggested that the first portion of the works should be a large storage reservoir on the head waters of the River Usk, which would contain 4½ million gallons, the estimated cost being £1,315,000. From this reservoir 12 million gallons of water could be delivered daily; and the quantity could be doubled by a further expenditure of £300,000.

St. Ives Corporation Gas-Works.—At a meeting of the St. Ives, Cornwall, Town Council a short time since, the Mayor (Mr. E. Hain) referred to the ceremony, which was recently noticed in the "JOURNAL" (*ante*, p. 1045), connected with the completion of the re-organization of the gas-works, and congratulated the members on the works having paid their way in the first year of the Corporation's ownership, notwithstanding the reconstruction, and before the change from the old to the new was completed. He had every confidence that, now the new works were finished, and an increased consumption might be expected from the reduction in price and the growth of the town, the undertaking would earn enough to pay the interest on the loans. This was better than was expected when they purchased the works, for even the most sanguine of them thought that for a year or two some portion of the cost would fall on the borough. They obtained power to borrow £6500; and out of this they had a sum of £700 left. It was true that, in the estimate, £500 was put down for the renewal of mains; but if this were spent, they would still have about £200 to their credit, and the whole work would have been carried out for this amount less than the estimate. This was a most gratifying fact. He was assured by experts that they had gas-works which were efficient in every respect, and second to none of their size in the West of England. They had obtained them on a small capital; and it would be contrary to all experience if they did not prove highly remunerative. They were greatly indebted to the Town Clerk (Mr. E. Boase) for his services in the matter. The Mayor added that, as soon as everything was settled, a statement of accounts would be issued to the members.

The Cirencester District Council and the Water-Works.—A Committee has been appointed by the Cirencester District Council to inquire as to the advisability or otherwise of purchasing the local water undertaking. The Directors of the Company are willing to treat with the Council on fair and reasonable terms; but, according to the Chairman, the shareholders will want full compensation for the losses and risk they have incurred in the past, and for being deprived of the profits which might be anticipated in the future.

The Gaslight and Coke Company and the Rates at Barking.—The Directors of The Gaslight and Coke Company, are offering strong opposition to an application by the Barking District Council to the Local Government Board for power to borrow £17,880 for the construction of a subway under the creek. They point out that the Company pay five-ninths of the rates, which have risen from £7000 in 1885 to £16,000 in 1895; and their opposition is based on the ground that the subway is entirely unnecessary.

Newbury Corporation Gas Supply.—At the last quarterly meeting of the Newbury Corporation, the report of the Gas Committee for the year ending March 31 last was presented. Mr. Smith, in moving its adoption, said there had been a steady increase in the output of gas; and for every ton of coal carbonized no less than 10,814 cubic feet of gas was produced. Residuals had all gone down in value, and had an adverse effect on income. Sulphate, on which last year they made a profit of £145 2s., yielded now only £49; and there was a difference on the wrong side of £60 in the receipts for coke. This could be accounted for by the very mild winter they had experienced; and the prices had to be lowered to get rid of the coke. There was a total loss of £186 for residuals alone; but this was general with gas undertakings. The unusual amount of leakage—3,920,000 cubic feet—would no doubt astonish the members; and the only way to account for it was the damage done to the mains by the sewerage works—no plan having been submitted to the contractor. The profits on the year's working had amounted to £1842, which was only £190 less than last year. Therefore, taking into consideration the various matters he had mentioned, he thought they had made a fair year. Dr. Douglas contended that the figures in the accounts showed a balance to the bad, and that the gas undertaking was not a paying concern. He said the Banbury Gas Company, with a capital of £20,000 only, made such profits as would pay dividends of 10 and 7 per cent. The immense loss by leakage—nearly one-eighth of the total production—was a very bad feature. Calculated at 4s. 2d. per 1000 cubic feet, this represented a total loss of £816 10s., sufficient to pay a dividend of 3¾ per cent. on the capital of £28,000. In reply to various questions, Mr. Smith said it was unfair to compare their undertaking with that at Banbury, which was a private concern. There they had no sinking fund to provide for; whereas at Newbury, whether trade was bad or good, they were heavily handicapped by having to provide £481 each year to the sinking fund. He firmly believed that matters had taken a turn, and that they were now on the right road. The report was adopted.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 1210).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Apl.	10½	Alliance & Dublin 10 p. c.	25—26	..	4 0 9
100,000	10	,,	7⅞	Do. 7 p. c.	17—18	..	4 3 4
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	110—112	..	4 9 3
200,000	10	16 Oct.	5†	Belgrano (B. Ayres), Limited	9¼—9⅝	+¼	5 2 7
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	100—105	+3	4 15 3
200,000	5	29 May	6½	Bombay, Limited	7¼—7⅝*	..	4 3 10
40,000	5	,,	6½	Do. New, £4 paid	5¾—6¾	+¼	4 6 8
380,000	Stck.	27 Feb.	12	Brentford Consolidated	282—287	..	4 3 7
210,000	,,	,,	9	Do. New	217—222	..	4 1 0
50,000	,,	,,	5	Do. 5 p. c. Pref.	—	..	—
159,375	,,	16 Dec.	4	Do. 4 p. c. Deb. Stock.	130—135	..	2 19 4
220,000	Stck.	27 Mar.	11	Brighton & Hove Original	237—242	..	4 10 11
208,820	,,	,,	8	Do. A Ord. Stk.	190—195	..	4 2 0
933,500	Stck.	27 Feb.	5	Bristol, 5 p.c. max.	127—132	..	3 15 9
420,000	20	27 Mar.	11¼	British	56—57	..	3 18 11
50,000	10	12 Mar.	11¼	Bromley, Ordinary 10 p. c.	22½—23½	..	4 17 10
71,000	10	,,	8½	Do. 7 p. c.	19—20	..	4 5 0
500,000	10	29 Apl.	5	Buenos Ayres (New) Limited	9¼—9⅝	..	5 2 7
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	103—105	..	5 14 3
150,000	20	27 Feb.	8½	Cagliari, Limited	29—31	..	5 6 5
100,000	10	29 May	8	Cape Town & District, Ltd.	16½—17½*	+½	4 11 4
50,000	50	2 May	6	Do. 6 p. c. 1st Mort.	58—60	..	5 0 0
550,000	Stck.	15 Apl.	13⅜	Commercial Old Stock	340—345	..	3 18 2
165,000	,,	,,	10⅔	Do. New do.	258—263	..	2 19 10
165,000	,,	16 Dec.	4½	Do. 4½ p. c. Deb. do.	147—152	..	2 19 2
800,000	Stck.	16 Dec.	13	Continental Union, Limited.	285—290	..	4 9 8
200,000	,,	,,	10	Do. 7 p. c. Pref.	218—223	..	4 9 8
51,600	Stck.	27 Feb.	14	Croydon Com'cial A 10 p. c.	—	..	—
157,500	,,	,,	11	Do. B 7 p. c.	—	..	—
535,000	Stck.	27 Feb.	5¼	Crystal Palace Ord. 5 p.c. Stk	130—135	..	3 17 9
60,000	,,	,,	5	Do. 5 p. c. Pref.	—	..	—
486,090	10	30 Jan.	11	European, Limited	26—27	..	4 1 6
354,060	10	,,	11	Do. £7 10s. paid	17½—18½	..	4 9 3
5,746,590	Stck.	13 Feb.	12¾	Gaslight & Coke, A, Ordinary	308—313	..	4 1 5
100,000	,,	,,	4	Do. B, 4 p. c. max.	108—113	..	3 10 9
665,000	,,	,,	10	Do. C, D, & E, 10 p. c. Pf.	297—302	..	3 6 3
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	145—150	..	3 6 8
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	210—215	..	3 9 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	205—210	..	3 6 8
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	295—300	..	3 6 8
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	172—177	..	3 7 10
1,061,150	,,	16 Dec.	4	Do. 4 p. c. Deb. Stk.	140—145	..	2 15 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	150—155	..	2 18 0
908,000	,,	,,	6	Do. 6 p. c. do.	204—209	..	2 17 5
70,000	10	14 May	6	Hongkong & China, Limited	12½—13½	..	4 8 10
3,800,000	Stck.	14 May	12	Imperial Continental	245—250	−5	4 16 0
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	100—103	..	3 17 8
473,600	Stck.	13 Feb.	3½	Do. 3½ p. c. Deb. Stk ,,	108—110	..	3 3 8
75,000	5	16 Dec.	6	Malta & Mediterranean, Ltd.	6½—7	..	4 5 8
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	115—118	..	4 4 10
250,000	100	,,	4½	Do. 4½ p. c. Debs.	110—112	..	4 0 4
541,920	20	14 Nov.	5	Monte Video, Limited	17—18	..	5 11 1
150,000	5	29 May	8	Oriental, Limited	8½—8¾*	+¼	4 11 5
135,000	5	,,	8	Do. New, £4 10s. paid	7½—7¾*	+¼	4 12 10
15,000	5	,,	8	Do. do. 1879, £1 paid	1—2*	+⅛	4 0 0
60,000	5	12 Mar.	7	Ottoman, Limited	5—5½	..	6 7 3
166,870	10	—	2	Para, Limited	1¼—1⅝	..	—
420,000	100	2 Nov.	6	People's Gas 1st Mtg. Bds.	105—110	..	5 9 1
500,000	100	9 Dec.	6	of Chicago 2nd Do.	105—110	..	5 9 1
250,000	10	27 Mar.	8	San Paulo, Limited	13—14	−½	5 14 3
500,000	Stck.	13 Feb.	15½	South Metropolitan, A Stock	405—415	+5	3 14 8
1,350,000	,,	,,	12	Do. B do.	315—320	..	3 15 0
310,000	,,	,,	13	Do. C do.	335—340	..	3 16 6
800,000	,,	16 Jan.	5	Do. 5 p. c. Deb. Stk.	175—178	..	2 16 2
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	250—255	..	4 10 2
60,000	,,	,,	8½	Do. B	—	..	—
170,380	10	29 May	10	Tuscan, Limited.	13½—14¾*	+¾	6 18 0
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	100—102	..	4 18 0
				WATER COMPANIES.			
746,021	Stck.	30 Dec.	10½	Chelsea, Ordinary	345—350	+7	2 18 7
150,000	,,	,,	5	Do. 5 p. c. Pref.	172—177	+2	2 16 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	—	..	—
175,785	,,	27 Mar.	4½	Do. 4½ p. c. Deb. Stock	158—163	+1	2 15 2
1,719,514	Stck.	15 Apl.	7	East London, Ordinary	245—250	..	2 16 0
654,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	157—162	..	2 15 6
100,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	105—107	..	2 16 1
700,000	50	16 Dec.	7½†	Grand Junction, 10 p.c. max.	127—132	+3½	2 16 9
280,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	148—152	..	2 12 8
708,000	Stck.	13 Feb.	12	Kent	347—352	+7	3 8 3
160,000	,,	,,	7	Do. New, 7 p. c. max.	215—220	..	3 3 7
1,043,800	100	30 Dec.	7½†	Lambeth, 10 p. c. max.	275—280	..	2 11 8
406,200	100	,,	7½†	Do. 7½ p. c. max.	227—232	..	3 2 6
350,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	147—152	..	2 12 8
500,000	100	13 Feb.	12¾	New River, New Shares	430—435	..	2 18 7
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	154—159	..	2 10 4
902,300	Stck.	16 Dec.	6	S'thwk & V'xhall, Ordinary	167—172	..	3 9 9
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	155—165	..	3 12 9
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	168—173	..	2 17 9
1,019,585	,,	15 Apl.	4	Do. 4 p. c. A Deb. Stk.	147—152	..	2 12 8
1,155,066	Stck.	16 Dec.	10	West Middlesex	327—332	..	3 0 2
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	157—162	..	2 15 6

†Next dividend will be at this rate. *Ex div.

Sales of Shares.—At Deal, last Wednesday, a number of shares in the Deal and Walmer Gas Company changed hands as follows: Five "A" £10 shares, at £22 2s. 6d. each; and three at £22 5s.; three "B" shares, of £1 5s. each, at £1 7s. each; thirteen "C" £10 shares (£7 10s. paid), at £12 12s. 6d. each.——At Staplehurst, on the same day, ten £5 shares in the Staplehurst Gas Company realized £52 10s. ——Some new £10 shares in the Boston (Lincs.) Gas Company changed hands last week at £15 10s. each, and a few old £10 shares at £19.——At a recent sale by auction by Messrs. J. Woodhams and Son, at Hastings, some £20 shares in the Hastings and St. Leonards Gas Company realized £51 5s., £51 10s., and £53 each. Investors are therefore not frightened by the latest move of the Hastings Corporation, to which reference is made in our "Electric Lighting Notes."

Congress of the Gas Workers' Union.—The fifth congress of the National Union of Gas Workers and General Labourers was held in Bristol last week, under the presidency of Mr. Pete Curran, the General Organizer. The General President (Mr. M. Hutchins) presented his report, which was adopted. The General Secretary (Mr. W. Thorne) also submitted a report accompanied by the statement of accounts. Referring to the figures, he stated that during the twelve months ending Dec. 31, 1895, the receipts amounted to £7179, of which the sum of £6965 came from members' contributions. At the beginning of the year there was a balance in hand of £6883; so that the total for the year was £14,062. A considerable sum had been distributed in dispute pay; while the contributions to other societies who were engaged in disputes amounted to £229. The legal expenses were £323; and the cases had been very successful as a whole. Salaries amounted to £1432. After giving particulars of other items of expenditure, Mr. Thorne said the total was £6125; and so the total funds in their hands at the end of December were roughly £7947. The figures showed that the society was making great progress. As an instance of the headway being made, he mentioned that between December, 1895, and the March quarter, 1896, there had been a net gain of £598; and but for two drawbacks, with which the members were acquainted, there would have been a gain during the past quarter of £900. After speaking of the work of the Executive Council on various matters, he urged that the Union must be national and not local. The reports were adopted. The general business consisted mainly of resolutions affecting the rules and constitution of the Union; but several other matters were also considered. The congress resolved that no Employers' Liability Bill would be satisfactory to the members of the Union which contained any clause permitting contracting out, sub-contracting, or common employment; neither would any such Bill be satisfactory unless it contained a clause compelling employers to set up their line of defence. The congress also declared that the time had arrived when the hours of labour should be limited to eight per day. Mr. M. Hutchins was re-elected President; Mr. W. Thorne, General Secretary; Mr. Pete Curran, General Organizer; and Mr. Bygood, Treasurer.

The Economical Gas Apparatus Construction Company's Carburetted Water-Gas Plant.—We learn that the carburetted water-gas plant erected by this Company at Colchester was started on the 8th ult. without a hitch, and has since been running successfully. The plant for Birmingham is being pushed through with all possible rapidity, in order to have it completed within the specified time. At Blackburn, Mr. Ogden has been getting better results than were obtained while the plant was in the hands of the Company. The Birkenhead Corporation have recently placed with them an order for the installation of plant capable of making upwards of 2½ million cubic feet of gas daily.

Incandescent Fire-Mantel and Stove Company, Limited.—The statutory general meeting of this Company was held at the Cannon Street Hotel, on Friday, the 22nd ult.—Lord Headley (the Chairman) presiding. The Secretary (Mr. D. Macphail) having read the notice convening the meeting, the Chairman explained that, as it was a purely formal gathering, the Directors had no report to submit and no accounts to present. All they had to state was that the purchase had been completed of the valuable patent, which he had very little doubt would lead to good business. A shareholder having asked for some information in regard to the Company's stove, it was furnished by the Engineer (Mr. T. E. Pye). In answer to a question, the Chairman stated that the foreign patent rights had not been sold; but applications had been received from all parts of the world, and were under consideration. A vote of thanks was accorded to the Directors, and the fullest confidence in them expressed.

New Joint-Stock Companies.—The Pioneer Petroleum Syndicate, Limited, with a capital of £50,000, in £1 shares, is to acquire, by purchase or otherwise, work, develop, and generally turn to account any land, oil wells, refineries, &c., and to generally deal with and distribute petroleum and petroleum products. House's Cement and Anti-Crustator Company, Limited, with a capital of £25,000, in £1 shares, is to enter into an agreement with a Company with a similar title (in liquidation), and to carry on business as cement and anti-crustator manufacturers. The Consolidated Water-Works Company of Rosario, Limited, with a capital of £245,000, in £10 shares, is to adopt and carry into effect an agreement expressed to be made between the Rosario Water-Works Company, Limited, of the one part, and this Company of the other part, to acquire the benefit of the Rosario water concession, or any modification thereof, to supply the town of Rosario in the province of Sante Fé, in the Argentine Republic, and the neighbourhood, with water, to deal with the same in such manner as the Company shall see fit, and to carry on the business of a water-works company in all its branches. The New Incandescent (Sunlight Patent) Gas Lighting Company, Limited, has been formed, with a capital of £200,000—£50,000 in 6 per cent. cumulative preference shares, and £150,000 entitled to a cumulative dividend of 6 per cent. after the preference shares—to acquire the patent and business of the Sunlight Incandescent Gas-Lamp Company, Limited.

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203	11½ by 11 by 10	9 by 9 by 6¼	12s. 6d.
204	13½ „ 12½ „ 10	10¾ „ 10¼ „ 6¼	15s. 0d.
206	13½ „ 12½ „ 10	10¾ „ 10¼ „ 7½	25s. 0d.

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They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

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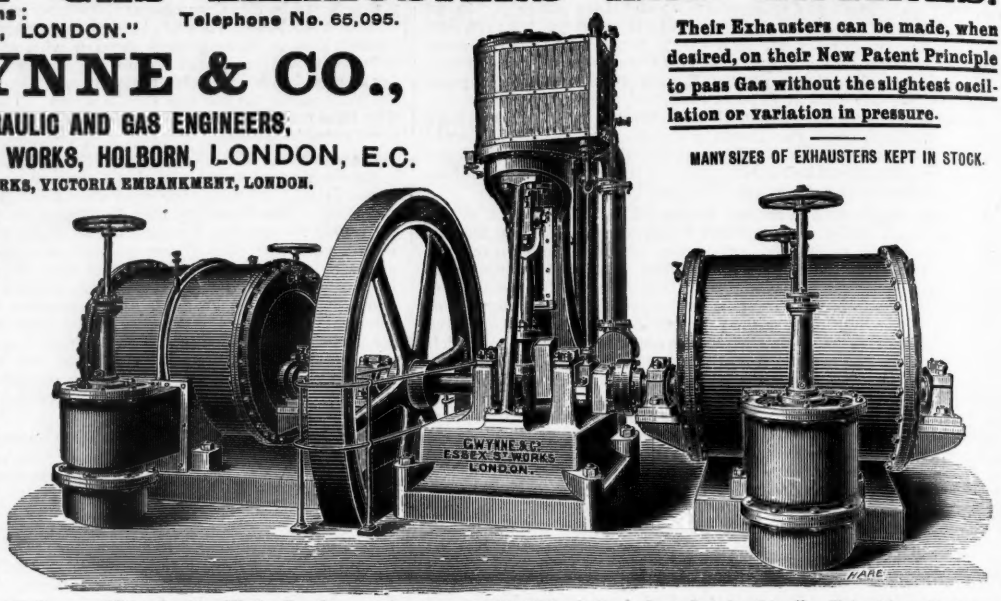

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BOROUGH OF MACCLESFIELD.

THE Gas Committee are prepared to receive TENDERS for the supply of the whole or part of 10,000 Tons of the best screened GAS COAL and of 1000 Tons of CANNEL, to be delivered free at Macclesfield, at such times and in such quantities as shall be ordered. Deliveries to commence on the 1st of September, 1896, and to be completed within a Year.
Forms of Tender and Conditions may be had on application to the Engineer, Gas-Works, Macclesfield.
Tenders, sealed and endorsed, to be sent in not later than Saturday, the 20th day of June, 1896, addressed to the Chairman, Gas Committee, Town Hall, Macclesfield.
The Committee do not pledge themselves to accept the lowest or any tender.
W. FREDK. TAYLOR,
Town Clerk.
May 26, 1896.

THE INCORPORATED

Gas Institute.

THE THIRTY-THIRD

ANNUAL GENERAL MEETING

OF THE MEMBERS

WILL BE HELD ON

Tuesday, Wednesday, and Thursday,

the 9th, 10th, and 11th of June,

AT THE

HALL OF THE SOCIETY OF ARTS

18, JOHN STREET, ADELPHI, W.C.

THE CHAIR WILL BE TAKEN BY THE PRESIDENT,

WM. R. CHESTER, Esq., M.Inst.C.E.

On Friday, there will be a Trip down the Thames, round the Nore Light into Sheerness, returning to London Bridge. Full Particulars will be announced on the Programme.

THE BENEVOLENT FUND.

The Annual General Meeting of the Donors and Subscribers to the Benevolent Fund will be held on Tuesday, June 9, at 5 o'clock p.m.
WALTER T. DUNN, Secretary.
13, *Victoria Street, Westminster, S.W.*

TENDERS FOR COAL.

THE Directors of the Harlow and Sawbridgeworth Gaslight and Coke Company invite TENDERS for about 1000 Tons of good GAS COAL, delivered at Harlow Station free, in quantities of not less than 50 Tons. No Forms.
Tenders, addressed to the Secretary, Gas Company, Harlow, to be sent in on or before Friday, June 12, 1896, and to be sealed and endorsed "Tender for Coal."

NEWARK GAS COMPANY.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR produced at their Works for One Year from the 1st day of July, 1896, at per degree Twaddel (Temperature 60° Fahr.). The Liquor to be not less than 5° in Strength.
Terms: Cash monthly.
Further Particulars can be had on application to the undersigned, to whom sealed tenders, marked on the outside "Tender for Liquor," are to be sent on or before the 24th of June.
The highest tender will not be necessarily accepted.
F. B. FOOTTIT,
Secretary.
Newark, May 29, 1896.

NEWARK GAS COMPANY.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Newark Gas Company are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works, free on Rail, G.N.R. or M.R., in Purchaser's Tanks, for One Year from the 1st day of July, 1896.
Terms: Cash monthly.
Further Particulars can be obtained on application to the undersigned, to whom sealed tenders are to be sent on or before the 24th of June next, marked on the outside "Tender for Tar."
The Directors do not bind themselves to accept the highest or any tender.
By order,
F. B. FOOTTIT,
Secretary.
Newark, May 29, 1896.

LUDLOW UNION GAS COMPANY.

THE Company are prepared to receive TENDERS for the supply during the Twelve Months from June 30, 1896, to June 30, 1897, of from 1200 to 1500 Tons of best screened GAS COAL, in quantities and at times to suit the requirements of the Company.
Tenders to be forwarded to J. W. MONTFORD, Solicitor, Ludlow, SALOP.

CROMER, NORFOLK.

TENDERS FOR COAL.

THE Directors of the Cromer Gas and Coke Company, Limited, are prepared to receive TENDERS from Colliery Proprietors only, for the supply of 900 Tons of first-class GAS COAL, to be delivered at (*a*) the Great Eastern Railway Station, or (*b*) the Eastern and Midlands Railway Station, Cromer, between the 1st day of June next, and the 31st day of May, 1897. Weight given to be stated.
Deliveries to be made in such quantities and at such times as may be required by the Company.
Payment: Net cash monthly.
Sealed tenders, endorsed "Tender for Coal," to be sent to the undersigned, on or before the 8th of June next. Forms of tender are not supplied.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
P. E. HANSELL,
Secretary.
Cromer, May 26, 1896.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of about 23,000 Tons of GAS COAL for One Year from the 1st day of July next, in such monthly quantities as may be required by the Company.
Tenders to state the price delivered at the Midland Railway Wharf, High Orchard, or the Great Western Railway Wharf, Llanthony, Gloucester; or if sent (as preferred) by Water, the price f.o.b., and also the price delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.
Further Particulars and Forms of Tender may be obtained of the Company's Engineer, Mr. R. Morland.
Sealed tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than the 6th day of June next.
The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.
By order,
WILLIAM E. VINSON,
Secretary.
Gas Offices, Gloucester,
May 14, 1896.

COUNTY BOROUGH OF BURY.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Corporation are prepared to receive TENDERS for the supply for One, Two, or Three Years of—
3000 Tons of CANNEL per annum.
30,000 Tons of GAS COAL per annum.
500 Tons of BURGY per annum.
200 Tons of HOUSE COAL per annum.
The same to be delivered in such quantities and at such times as the Gas Engineer of the Corporation may from time to time order.
Printed Forms of Tender and Conditions of Contract may be obtained on application to Mr. W. H. S. Gendall, Engineer, Gas-Works, Bury.
Tenders, which must be on the printed forms, and addressed to the Chairman of the Gas Committee, Town Clerk's Office, Bury, marked "Tender for Gas Coal," to be delivered not later than the 17th of June, 1896.
Preference will be given to those persons or firms who pay to their workpeople the regular standard rate of Wages obtaining at the time in the town or district.
JOHN HASLAM,
Town Clerk.
Corporation Offices, Bury,
May 28, 1896.

Now Ready, Handsome Cloth, 9s. Post free,

GAS MANUFACTURE

(THE CHEMISTRY OF);

A HANDBOOK ON THE PRODUCTION, PURIFICATION, AND TESTING OF ILLUMINATING GAS, AND THE ASSAY OF THE BYE-PRODUCTS OF GAS MANUFACTURE.

For the Use of Students.

BY W. J. ATKINSON BUTTERFIELD, M.A., F.C.S.,

Head Chemist, Gas-Works, Beckton, London, E.

WITH NUMEROUS ILLUSTRATIONS.

*** This work deals with the MOST MODERN DEVELOPMENTS of the subject; and the chapter treating of the BYE-PRODUCTS will be found of special interest.

London: CHARLES GRIFFIN & Co., Ltd., Exeter Street, Strand.

PETTIGREW'S PATENT

Sulphate of Ammonia Plant

ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

Write for Particulars, Testimonials, and References to

GEO. PETTIGREW & Co.,

GAS AND CHEMICAL ENGINEERS,

MIDDLESBROUGH-ON-TEES

COUNTY BOROUGH OF OLDHAM.

TAR.

THE Gas-Works Committee invite TENDERS for the purchase of about 7200 Tons of TAR to be produced at their different Works during One Year commencing the 1st of July next.

Specification and Form of Tender may be obtained from Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom tenders are to be sent on or before Tuesday, June 9, 1896.

A. Nicholson,
Town Clerk.

Oldham, May 23, 1896.

TAR.

THE Directors of the Reading Gas Company invite TENDERS for the purchase of their surplus TAR for One Year, commencing on the 1st of July next.

Specifications for the contract will be forwarded on application.

Rail communication direct to the Works.

Tenders, endorsed "Tender for Tar," must be delivered not later than Monday, the 8th of June, to

Arthur H. Cane,
Secretary.

22, Market Place, Reading,
May 20, 1896.

WREXHAM GASLIGHT COMPANY.

TO IRONFOUNDERS, ETC.

THE Directors of the above Company invite TENDERS for the material and fixing of Two additional PURIFIERS, each 16 feet square, together with Pipes, Valves, &c., for same.

Plans and Specification may be seen at the Offices of the Company.

Sealed tenders to be sent in on a form provided for the purpose on or before the 10th prox.

By order,
Thos. Walker,
Secretary and Manager.

Wrexham, May 20, 1896.

BOROUGH OF EVESHAM.

(Gas Department.)

TENDERS FOR GAS COAL.

THE Corporation invite Tenders for the supply of from 500 to 1500 Tons of best screened GAS COAL during the Year ending the 30th of June 1897, to be delivered on Rail at Evesham.

Tenders to be sent in to me not later than the 8th of June next, with full description of Coal. No Forms of Tender supplied.

The Corporation do not bind themselves to accept the lowest or any tender.

Thos. Cox,
Town Clerk.

Town Clerk's Offices, Evesham,
May 20, 1896.

MID-SUSSEX WATER COMPANY.

HARD STEAM COAL.

THE Directors of this Company invite TENDERS for the supply of HARD STEAM COAL, to be delivered to Balcombe Railway Station, L.B. & S.C. Railway.

Further Particulars may be obtained upon application to the undersigned.

Tenders, endorsed "Coal," to be addressed to H. J. Robus, Chairman, 20, Bucklersbury, London, E.C., on or before Friday, June 12.

The Directors do not bind themselves to accept the lowest or any tender.

By order of the Board,
F. W. Dobson,
Secretary.

Water Office, South Road,
Haywards Heath, Sussex.

COUNTY BOROUGH OF WEST BROMWICH.

(Gas Department.)

TO COLLIERY PROPRIETORS.

THE Gas Committee are prepared to receive TENDERS for the supply of 21,000 Tons of GAS COAL, for use at their Works, Albion, West Bromwich.

The Committee do not bind themselves to accept the lowest or any tender; and they reserve to themselves the right to divide the contract between several Firms.

Forms of Tender may be obtained upon application to Mr. Thomas Glover, Manager of the Works.

Sealed tenders, properly endorsed, to be sent to me not later than Monday, June 8.

By order,
Thos. Hudson,
Secretary.

Town Hall, West Bromwich,
May 18, 1896.

CORPORATION OF LEICESTER.

COAL TENDERS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply of COAL, COBBLES, or NUTS for One or Two Years ending May 31.

Particulars and Form of Tender can be obtained on application to the Engineer.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Gas Coal," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, the 6th of June next.

The Committee do not bind themselves to accept the lowest or any tender.

Alfred Colson, M.Inst.C.E.,
Engineer and Manager,

Offices: Millstone Lane, Leicester,
May 16, 1896.

GREAT WIGSTON GAS COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company invite TENDERS for the supply of best screened GAS COAL, from 1800 to 2500 Tons for One Year ending June 30, 1897.

Particulars and Form of Tender can be obtained on application to the Manager.

Tenders, addressed to A. A. Cooper, Chairman, and endorsed "Tender for Coal," to be received not later than the 14th inst.

The Directors do not bind themselves to accept the lowest or any tender.

John A. Harris,
Engineer and Manager.

THE Directors of the Sevenoaks Gas Company are prepared to receive DRAWINGS and TENDERS for the renewal of two SINGLE-LIFT GASHOLDERS, 60 feet and 50 feet respectively; also for a TELESCOPIC GASHOLDER of two Lifts, to replace existing 60 feet Single Lift.

All Information may be had on application to the Company's Engineer, Mr. W. J. Dougall.

Tenders, addressed to the Chairman, to be delivered at my Office on or before June 10, 1896.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
Henry How,
Secretary.

88, High Street, Sevenoaks.

TENDERS FOR GASHOLDER TANK.

THE Sutton, Southcoates, and Drypool Gas Company, Hull, are prepared to receive TENDERS for the construction of a BRICK and PUDDLE GASHOLDER TANK, 152 feet diameter and 35 feet deep.

Drawings, Specification, and Quantities may be seen at the Company's Office, St. Mark's Street; and Copies of the Specification, Quantities, and Conditions obtained on application to the undersigned on payment of Two Guineas, which will be returned on receipt of a *bond-fide* tender.

Tenders, sealed and endorsed "Tender for Gasholder Tank," to be sent to the Chairman not later than Monday, the 22nd of June next.

The lowest or any tender not necessarily accepted.

Geo. Oldfield,
Manager.

COUNTY BOROUGH OF HUDDERSFIELD.

TENDERS FOR GAS COAL AND NUTS.

THE Gas Committee are prepared to receive TENDERS, from Colliery Proprietors only, for the supply and delivery of from 50,000 to 60,000 Tons of unscreened GAS COAL and screened NUTS for a period of Twelve Months, commencing the 30th of September next.

Full Particulars and Form of Tender may be obtained on application to the Engineer and Manager, Mr. W. R. Herring, Gas-Works, Huddersfield.

Sealed tenders, endorsed "Tender for Gas Coal," must be delivered, free of charge, addressed in the handwriting of the tenderer or his agent to the Town Clerk, Town Hall, Huddersfield, and delivered not later than Thursday, the 18th day of June, 1896.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
F. C. Lloyd,
Town Clerk.

Town Hall, Huddersfield,
May 27, 1896.

SCARBOROUGH GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Scarborough Gas Company invite TENDERS for the surplus TAR and the whole of the AMMONIACAL LIQUOR to be produced at their Works for One or more Years from the 1st day of July next.

Tenders for Liquor may be submitted either at a fixed Price per ton or on a Sliding Scale, regulated by the Price of Sulphate. Preference will, however, be given to the latter.

Further Particulars may be obtained on application to the undersigned, to whom sealed tenders (duly endorsed) must be delivered not later than noon, on Saturday, the 13th of June next.

The Directors do not bind themselves to accept the highest or any tender.

By order of the Board,
(Signed) J. Holliday,
Engineer and Secretary.

Gas Offices: 32, Westborough, Scarborough,
May 20, 1896.

CITY OF LEEDS.

(Gas Department.)

THE Gas Committee of the Leeds City Council are prepared to receive TENDERS for the supply of about 40,000 Tons of CANNEL and about 140,000 Tons of best GAS COALS (Screened or Nuts). Price per ton to be quoted delivered at the Meadow Lane Gas-Works (Hunslet Lane Siding), New Wortley (Gelderd Junction Siding), or at the Gas-Works, York Street, in such quantities as may be required.

Forms of Tender, and further Particulars, may be obtained on application to the undersigned.

Tenders may be for any portion of the total quantity required, and will be received not later than Wednesday, the 17th of June next, addressed to the Chairman of the Gas Committee, Municipal Offices, Calverley Street, and endorsed "Tender for Coal."

The Committee do not bind themselves to accept the lowest or any tender.

R. H. Townsley,
General Superintendent.

Municipal Offices, Calverley Street,
Leeds, May 30, 1896.

CONTRACT FOR GAS COAL.

NOTICE is Hereby Given, that the Urban District Council of Horncastle, in the County of Lincoln, are prepared to receive TENDERS for the supply of from 500 to 1900 Tons (Railway weight) of best screened SILKSTONE GAS COAL and GAS NUTS, to be delivered by the 30th of June, 1897, in such quantities, and at such times, as the Council may direct. The Coal to be sent in a dry condition, free from Hards, Smudge, Dirt, Shale, Pyrites, or other Impurities.

Sealed tenders, marked "Tender for Gas Coal," to be sent to the Chairman of the Council, Mr. John Day, J.P., Maypole House, Horncastle, on or before the 13th day of June, 1896.

The Council do not bind themselves to accept the lowest or any tender.

By order of the Council,
S. Goe Overton,
Clerk.

20, East Street, Horncastle,
May 26, 1896.

SMETHWICK GAS-WORKS.

TENDERS FOR GAS COAL AND LIME.

THE Gas Committee of the Urban District Council of Smethwick invite TENDERS for the supply of about 17,000 Tons of GAS COAL, for delivery over the Year ending the 30th of June, 1897.

Forms of Tender may be obtained from the undersigned.

Tenders are also invited for the supply of about 300 Tons of Purifying LIME during the same period.

Sealed tenders, endorsed "Tender for Gas Coal" or "Lime" (as the case may be), and accompanied, if possible, by an Analysis, to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned on or before June 16, 1896.

By order,
W. J. Sturges,
Secretary.

Public Buildings, Smethwick,
May 28, 1896.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, Finsbury Circus, E.C.

BY ORDER OF THE DIRECTORS OF THE WEST HAM GAS COMPANY.

SALE OF £10,000 DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell by AUCTION at the Mart, London, E.C., on Wednesday, the 17th of June, at Two o'clock precisely, in Lots, £10,000 PERPETUAL 4 PER CENT. DEBENTURE STOCK OF THE WEST HAM GAS COMPANY, to be created under the Provisions of the West Ham Gas Act, 1889, and offering to Trustees and others an Investment of the soundest character.

Particulars of the Secretary of the Company, at the Offices, Stratford; and of the Auctioneer, 18, Finsbury Circus, E.C.

BY ORDER OF THE DIRECTORS OF THE ENFIELD GAS COMPANY.

ISSUE OF 900 £10 SHARES.

MR. ALFRED RICHARDS is favoured with Instructions from the Directors TO SELL BY AUCTION, at the Mart, Tokenhouse Yard, London, E.C., on Monday, June 8, at One for Two o'clock precisely, in lots, 900 £10 SHARES (fully-paid) in the ENFIELD GAS COMPANY, issued in pursuance of the Enfield Gas Order, 1883, ranking for a Maximum Dividend of 7 per cent. per annum (the last Dividend on the same class of Shares having been at this rate), and offering a thoroughly sound investment.

Particulars may be obtained of Mr. C. W. Offord, the Secretary of the Company, at the Offices, Enfield Town; and of Mr. Alfred Richards, Auctioneer, 18, Finsbury Circus, E.C., and 816, High Road, Tottenham.

Gas and Water Stocks and Shares of the Capital Value of upwards of £15,000 brought into the Market by order of the Executors, and

TO BE SOLD BY AUCTION BY

MR. ALFRED RICHARDS at the Mart, Tokenhouse Yard, E.C., on Monday, June 15, at Two o'clock precisely, in Lots.

The Stocks and Shares are in the following Undertakings:—

Crystal Palace District Gas Company, £2412 Stock.
Barnet District Gas and Water Company, £1305 Stock.
Hastings and St. Leonards Gas Company, 36 £20 Shares.
Bournemouth Gas and Water Company, 84 Shares.
Worthing Gaslight and Coke Company, 117 £10 Shares.
Chipping Norton Gas Company, 211 Shares.
Ascot District Gas Company, 83 £10 Shares.
Wandsworth and Putney Gas Company, £76 10s. Stock.
Enfield Gas Company, 11 £10 Shares.
Winchester Water and Gas Company, 12 £25 Shares.
West Kent Gas Company, 17 Shares.
Portsea Island Gas Company, 7 Shares.
Bognor Gas Company, 5 Shares.
Soham Gas Company, 30 £10 Shares.

All paying good Dividends and offering Investments of the very highest character.

Full Detailed Particulars, when ready, may be obtained of the Auctioneer, 18, Finsbury Circus, E.C.

TENDERS FOR GAS COAL.

THE Gas Committee of the Town Commissioners of Newry invite TENDERS for the supply of from 3000 to 3600 Tons of GAS COAL, to be delivered in such quantities as may be required by the Committee, and delivered free *ex* Ship or Steamer at Albert Basin, Newry.

The Coal to be fresh wrought, dry, and free from Clench, Pyrites, or other objectionable matter for Gas Making.

The Committee would assist the Contractor by allowing him to deliver about 1000 Tons of Coal prior to the 1st of November next.

Further Particulars may be obtained from Mr. A. Gibb, Manager.

Sealed tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, and where raised, to be addressed to the Chairman, and delivered to the undersigned not later than Ten a.m., on Friday, the 5th of June next.

The Committee reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.

By order,
R. H. DOHERTY,
Town Clerk.

New Town Hall, Newry,
May 23, 1896.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCKS and BONDS, WILL BE CLOSED at Four o'clock p.m. on Wednesday, the 10th inst., for the Half Year ending on the 30th inst., and will be RE-OPENED on the morning of Thursday, the 11th inst.

The Interest for the Half Year will be payable on the 1st of July next to the Proprietors registered on the closing of the Books.

By order,
J. W. FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., June 1, 1896.

MALTA AND MEDITERRANEAN GAS COMPANY, LIMITED.

TO THE SHAREHOLDERS.

NOTICE is Hereby Given that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices, 60, Gracechurch Street, London, E.C., on Tuesday, the 16th of June, 1896, at Twelve o'clock at Noon, for the purpose of receiving the Report of the Directors and the Accounts for the Year ended the 31st of March, 1896, and for the transaction of the General Business of the Company.

One of the Directors, Colonel James Le Geyt Daniell, will retire from office, but offers himself for re-election.

The Auditors, Mr. Robert Hesketh Jones and Mr. Thomas Guyatt, will retire from office, but are eligible for re-election.

The Transfer Books will be closed from the 2nd of June until the day of the Meeting, both days inclusive.

By order,
A. W. COOPER,
Secretary.

60, Gracechurch Street, E.C.,
May 19, 1896.

REPORTS OF GAS ASSOCIATIONS.

A FEW complete Sets of the Reports OF GAS ASSOCIATIONS from 1883 to 1894, twelve Volumes) may be obtained of the PUBLISHER of the "JOURNAL." *Price 30s., cash with order.* The Volume for 1895 (or single copies of previous Volumes) 5s. 6d. *post free.*

Price 5s. per 100.

THE USE OF

GAS LIME IN AGRICULTURE.

By Dr. A. VOELCKER.

A 4pp. Leaflet for Distribution among Farmers and others.

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THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc. M.Inst.C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

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COKE-BREAKERS,

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(THOMAS & SOMERVILLE'S PATENT)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
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And at STROUD, GLOUCESTERSHIRE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED,
— *v.* —
"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.
— *v.* —
"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT, WHETHER

MAKERS,
WHOLESALE DEALERS,
RETAILERS,
or
USERS.

Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

FAITHFULL & OWEN,
11, Victoria Street,
Westminster.
Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

NOTICE.

The attention of the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, having been again called to the Advertisements inserted in various papers by the Incandescent Gas-Light Company, Limited, of Palmer Street, Westminster, to the effect that the "Meteor" Incandescent Gas-Lights are an Infringement of their Patents, and that they will bring Actions for Infringement against all persons found dealing in any manner with such Lights, the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, HEREBY GIVE NOTICE that they are advised that the "Meteor" Incandescent Lights in no way infringe any of the Patents of the Incandescent Gas-Light Company, Limited, that an action has been commenced to restrain such threats, and that they are PREPARED TO FULLY INDEMNIFY ALL PURCHASERS, DEALERS, AGENTS, and USERS of their Lights against any Legal Proceedings on the part of the Incandescent Gas-Light Company, Limited.

WILSON, BRISTOWS, & CARPMAEL,
1, Copthall Buildings, London, E.C.,
Solicitors to the Meteor Incandescent Lighting Company, Limited, of 35, New Broad Street, London, E.C.

Nov. 30, 1895.

Fcap. 4to, Cloth, price 7s. 6d., post free.

Practical Photometry.

By William Joseph Dibdin, F.I.C., F.C.S.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

LOW MOOR BLACK BED

GAS COAL.

YIELD OF GAS PER TON - 10,375 CUBIC FEET.
ILLUMINATING POWER - 17·50 SPERM CANDLES.
COKE - - - - - - - - 75 PER CENT.

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A TRIAL IS RESPECTFULLY SOLICITED.

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Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

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HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—BY CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

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PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

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Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

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Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

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OUT OF THEIR

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Analysis made by
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Illuminating Power . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 ,,
Ash . . . . . 2·73 ,,

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Coke . . . . . 66·7 Coke.
Sulphur . . . . . 0·86 Sulphur.
Ash . . . . . 2·04 Ash.

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Coke . . . . . 68 per cent.

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Illuminating Power . . . . . 38·22 candles
Coke per ton . . . . . 1,301·36 lbs.

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Illuminating Power . . . . . 17·8 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
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or
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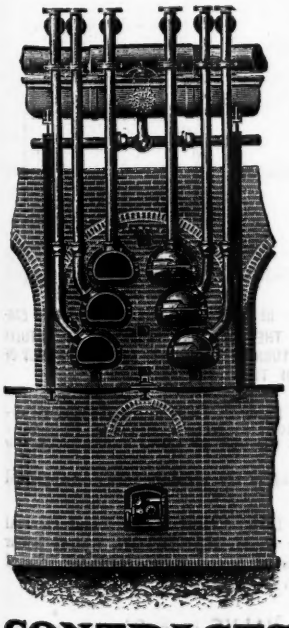

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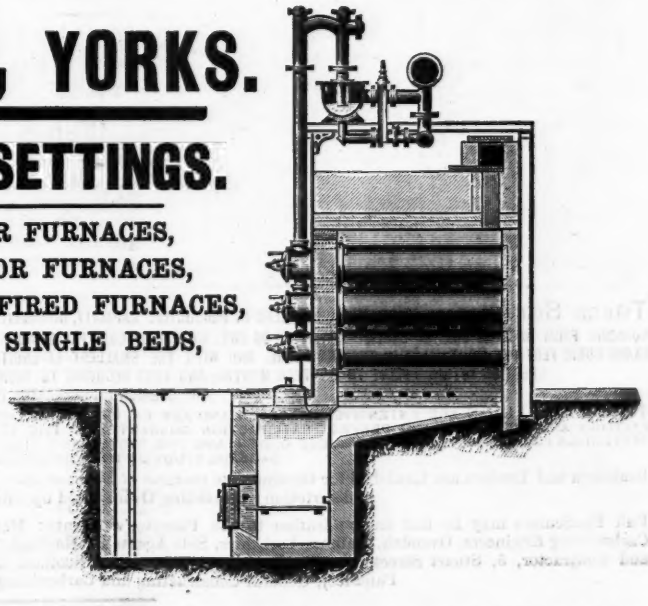

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Analysis: 12,600 Feet of 19-Candle Gas per Ton.

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VERY FREE FROM IMPURITIES.

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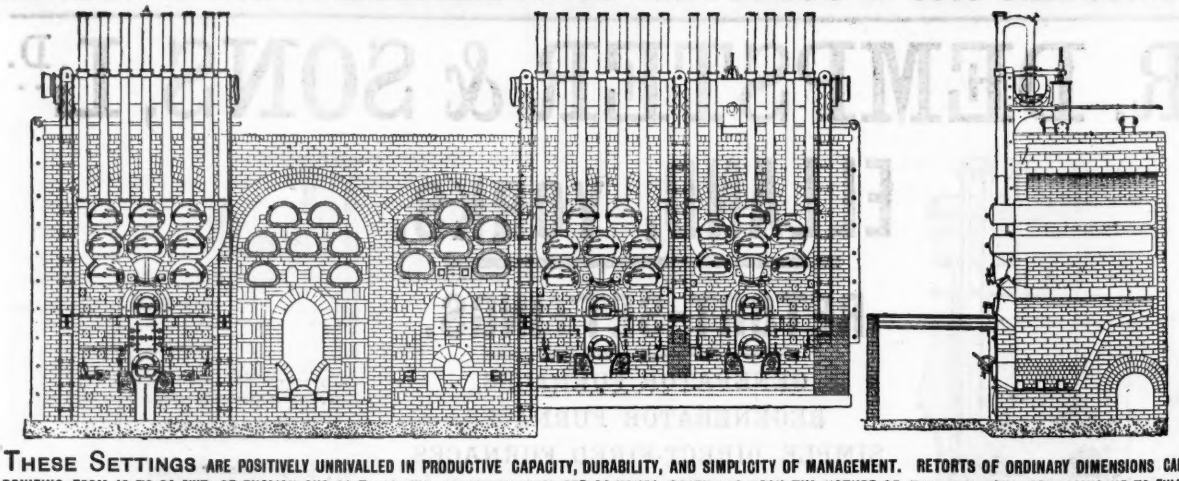
Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non.*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

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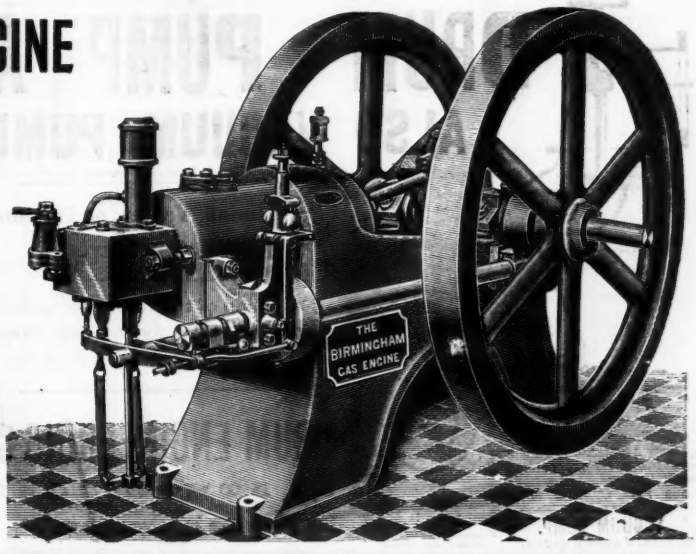

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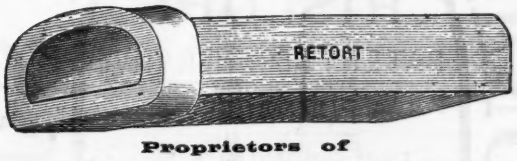

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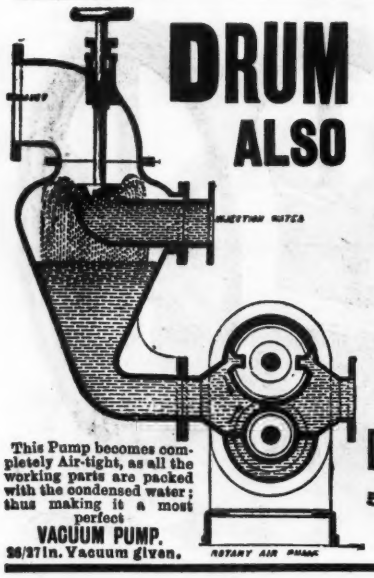

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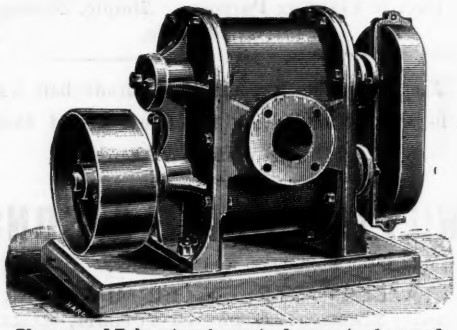

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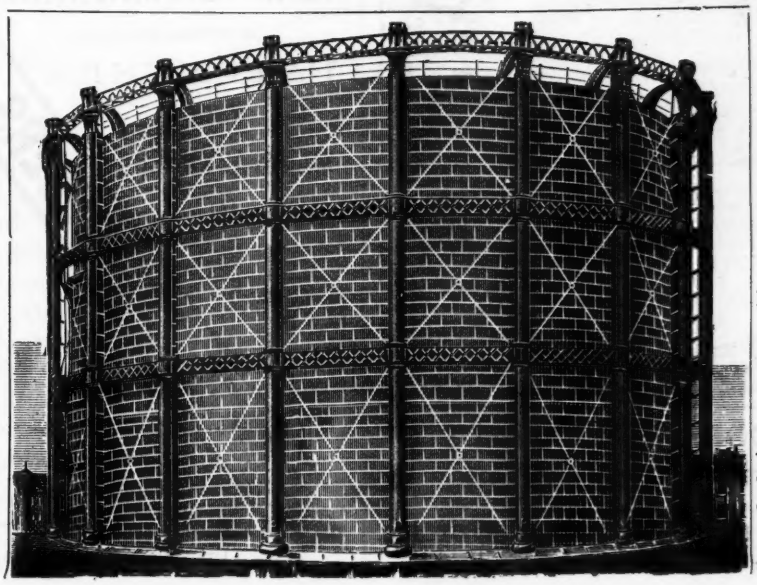

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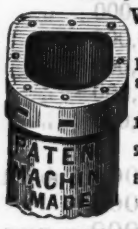

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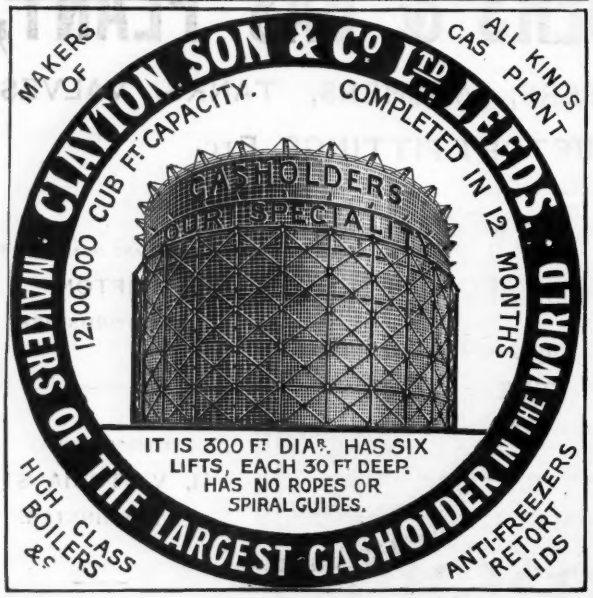
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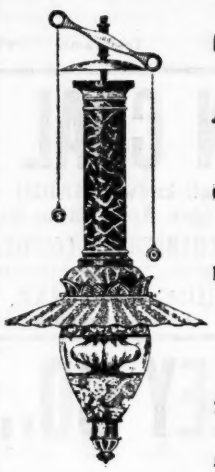

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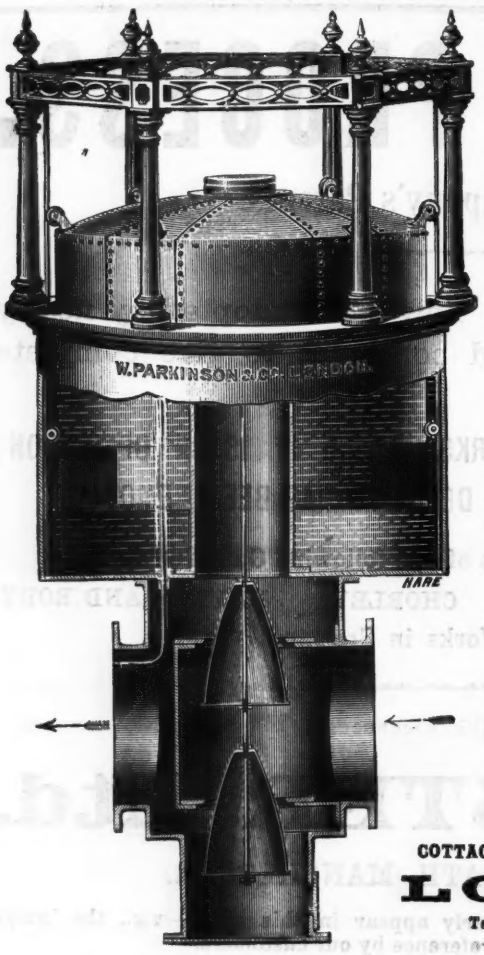

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[See also Advt. p. 1206.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 2, 1896.